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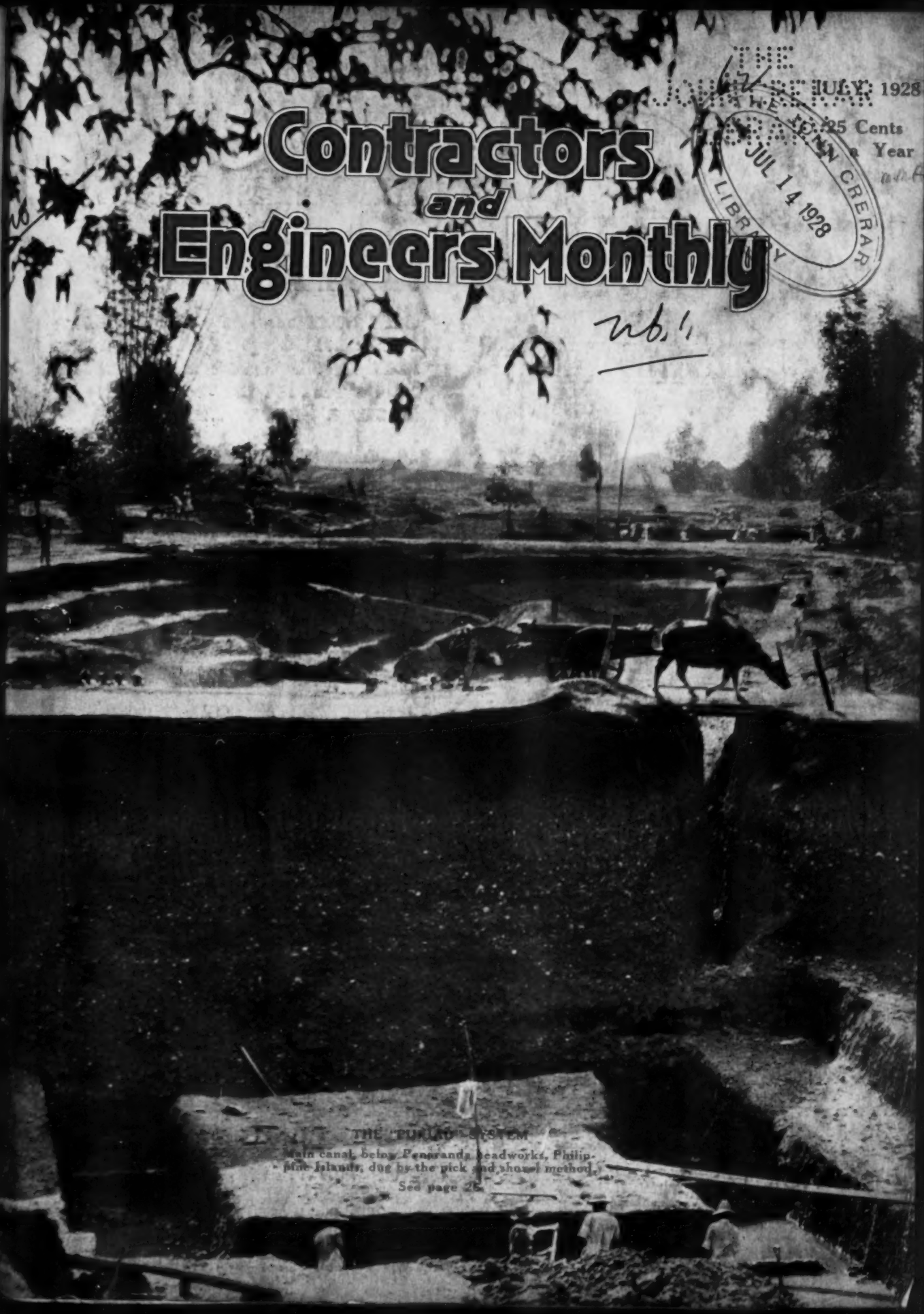

THE "PUTAO" SYSTEM

Main canal, below Penaranda headworks, Philippine Islands, dug by the pick and shovel method.

See page 25

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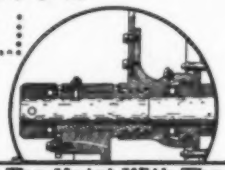

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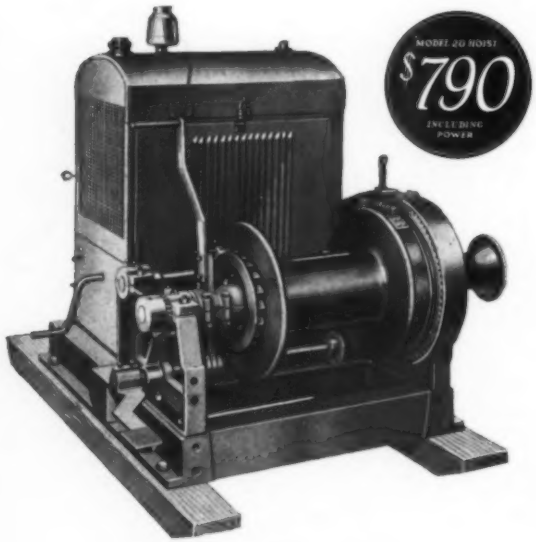

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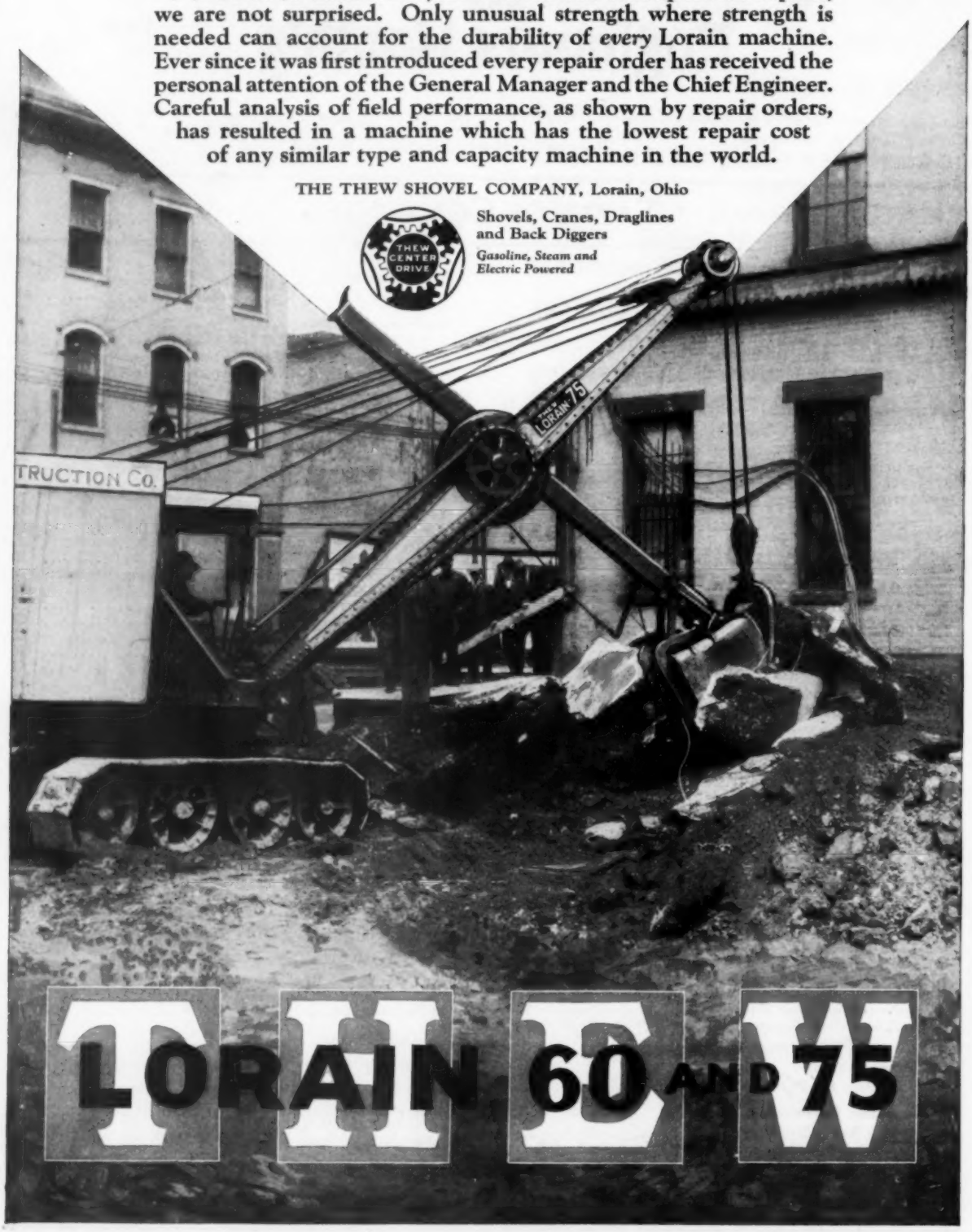

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The Holland, Mich., Sewage Treatment Plant

By Paul Hansen and K. V. Hill

Pearse, Greeley & Hansen, Sanitary and Hydraulic Engineers, Chicago, Ill.

THE sewage treatment plant and intercepting sewers at Holland, Mich., recently completed and placed in operation, involved a few construction difficulties and construction methods which may be of interest to contractors and engineers.

The sewage treatment works are designed to give partial treatment by clarification and sterilization of the sewage, practically all domestic, from a population of 22,500 people. The improvement comprises as main features: four Imhoff tanks, eight sludge drying beds, a sewage pumping station including a screen chamber, a grit catcher, and 1¼ miles of intercepting sewer, varying in size from 36 to 18 inches, and an outfall sewer. A general view of the plant is shown in Figure 1, and a general plan is shown in Figure 3. The works are located on a plot of land—the only available site which could be acquired—very close to some residences and a furniture factory. The odor hazard is therefore great and an effort has been made to neutralize this by making the appearance of the plant rather attractive. Original plans called for an ornamental brick wall about the Imhoff tanks to throw the odors upward and also included covering the sludge beds with greenhouses. tWall and greenhouses, however, had to be omitted for the time being owing to lack of funds.

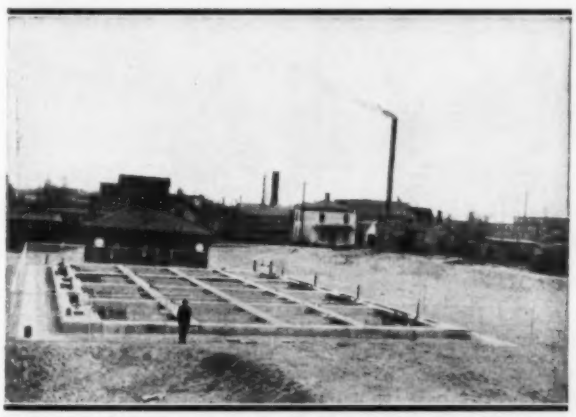


Figure 1. General View of the Holland, Mich., Sewage Treatment Plant as Completed

Construction of Imhoff Tanks

The Imhoff tanks are 101 feet long, 29 feet wide and 30 feet deep; each tank is provided with two hopper bottoms which are in the form of inverted truncated pyramids with side slopes of approximately 1½ to 1. Excavation for the tanks had to be carried out in relatively clean sand and gravel which took an angle of repose of about 1 to 1. Excavation was carried 7 feet below ground water level. To dewater the sand during construction, well points placed around the outside dimensions of the hoppers were used effectively as shown in Figure 2. With the sand dewatered, the side slopes stood firmly enough for concreting.

Figure 2. Well Points Placed Around the Outside Dimensions of the Hoppers to Dewater the Sand During Excavation

To prepare the slopes for receiving concrete and for supporting reinforcing steel without undue disturbance to the slopes, they were covered with a thin layer of lean concrete. To support the reinforcing steel for the hopper bottoms a cradle of 1-inch wrought iron pipe was imbedded in the concrete subbase, and the reinforcing steel fastened together to conform with the shape of the pyramidal hopper rested upon the cradle

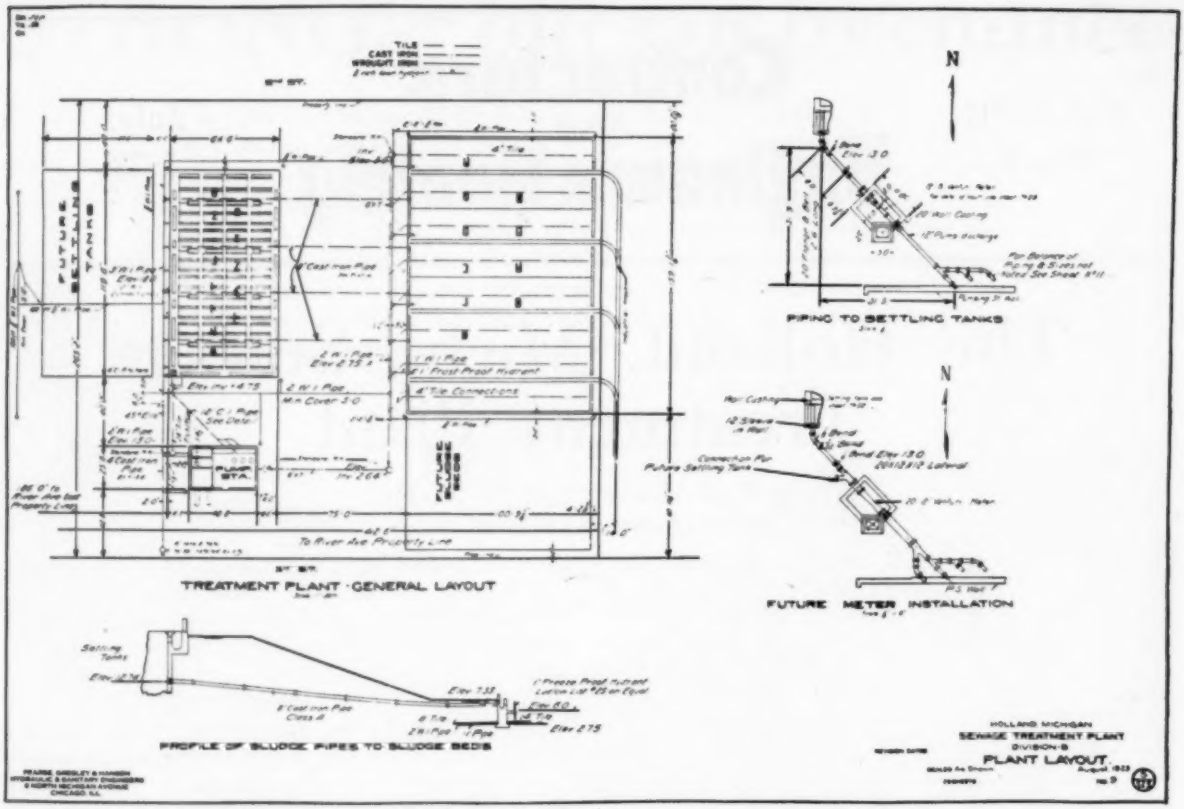


Figure 3. Plant Layout of the Holland, Mich., Sewage Treatment Plant

as shown in Figure 4. After the steel was placed, the forms for the top surface of the hoppers were lowered into place as shown in Figure 5.

All hopper bottoms were poured in mid-winter. An attempt was made to pour side slopes without using forms, but this was not found practicable on account of the necessity under winter conditions of using too dry a mixture to insure good concrete and a satisfactory bond with the reinforcing steel. It was found that in summer similar slopes could be made very readily without forms due to the more rapid setting of the concrete. Thorough precautions were taken to prevent freezing of concrete by covering over the work with tarpaulins and keeping the enclosed space heated with salamanders until the concrete was thoroughly set. The added precaution was taken of heating all aggregates and water used in making concrete.

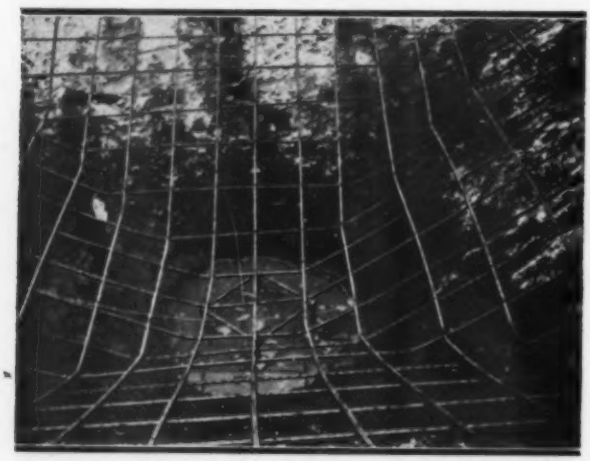


Figure 4. Cradle of One-Inch Wrought Iron Pipe to Support the Reinforcing Steel for the Hopper Bottom

Figure 5. Forms for the Top Surface of the Hoppers Being Lowered into Place After the Placing of the Steel

POURING DIVIDING WALLS

Dividing walls, which separate the sedimentation compartment of the Imhoff tanks from the sludge digestion chamber, are 4 inches thick. It was found difficult to secure good results by pouring the sloping portions from an angle with the horizontal of 54 degrees.

The contractor asked and obtained permission to form sloping portions of partitions by plastering against forms supporting the underside. By using this method very smooth surfaces were obtained. Because these partitions are continuously submerged in sewage a dense water-tight concrete in this connection was not important, but it was important to secure smooth surfaces. However, the concrete was carefully placed and thoroughly worked so as to obtain a strong concrete and complete insulation of reinforcing steel. This work was done in warm weather during which the concrete took a quick set and greatly facilitated the plastering operation. Figure 6 shows

Figure 6. Forms and Reinforcing Steel Ready to Receive Concrete Plaster

the forms and reinforcing steel ready to receive concrete plaster. Figure 7 shows the finished concrete surface.

FOUNDATIONS FOR SLUDGE DRYING BEDS

The sludge drying beds (see Figure 8) presented an interesting foundation problem. The only available space for the location of these beds is on a marshy area adjoining Black River. This area is filled to depths varying from several feet to as much as 20 feet with

Figure 7. Finished Concrete Surface of Sloping Portions of Dividing Walls Between the Sedimentation Compartment of the Imhoff Tanks and the Sludge Digestion Chambers

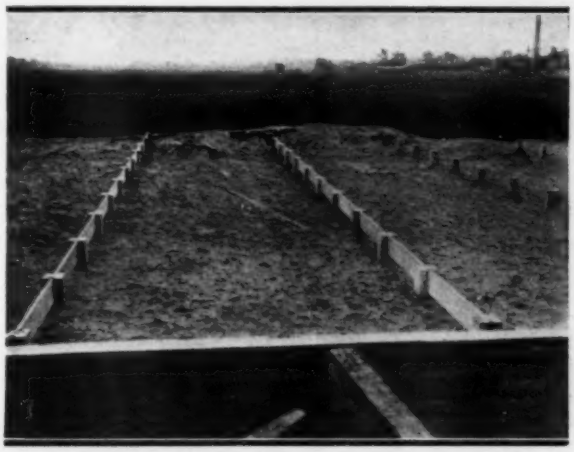


Figure 8. Sludge Drying Beds

very quakey organic muck deposits. Inasmuch as the sludge beds are but 12 inches thick it was deemed permissible to place them upon this somewhat uncertain foundation. As an added precaution the area for the sludge beds was brought to grade with a layer of 3 feet of sandy and gravelly material which was allowed to settle for a period of 8 months. Notwithstanding this

Figure 9. General View of the Open Trench Showing Sheeting and Piping for Well Points

precaution, one corner of the sludge bed area settled 4 or 5 inches. This did not seriously interfere with the functioning of the beds and was rectified by re-laying some of the underdrains. However, it emphasized the fluidity of mucky soil which seems to have the

Figure 10. *Driving Sheeting with an Air Hammer*

characteristics of a very thick molasses tending to flow from under a superimposed weight. The only means of obtaining a good foundation in material of this sort is to drive piles or columns to a solid bottom. Even this is dangerous if there are any conditions nearby which would tend to cause a lateral flow of the material.

PUMPING STATION

The pumping station required deep excavation similar to that of the Imhoff tanks. This was accomplished within interlocking sheet steel piling. The material enclosed by the sheet steel piling was dewatered by means of well points. In building this structure, it was important to keep the level of ground water below the bottom of the foundation during the period of active construction to prevent flotation. After the wet well and pump pit were completed the structure was filled with water to counterbalance the exterior water pressure while the superstructure was built. The structure

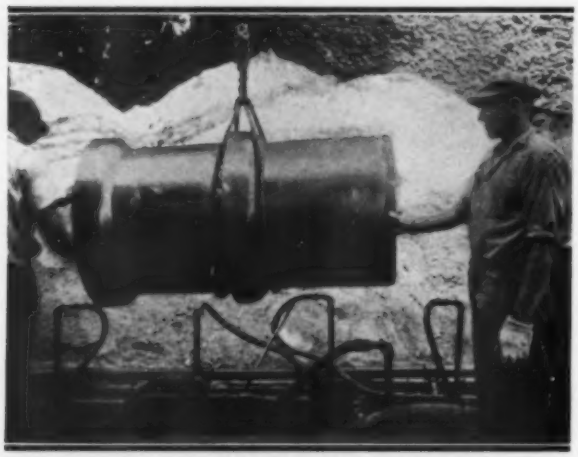


Figure 11. *Placing Two Lengths of Pipe Joined Together by Bituminous Joint Material*

as a whole was of sufficient weight to protect it against the upward pressure of ground water upon completion.

SEWER CONSTRUCTION IN FINE SAND

Much of the intercepting sewer and the outfall sewer had to be laid in trenches excavated in fine running sand. The intercepting sewers consist of vitrified pipe laid with bituminous joints. Bituminous joints were selected because they can be made more nearly watertight than the ordinary mortar joint. With bituminous joints a number of lengths of pipe can be joined together on the surface of the ground before lowering into the trench. Generally speaking the trenches were kept free from water by well points and close sheeting prevented the caving of banks. Figure 9 gives a general view of an open trench with sheeting and piping for well points. Figure 10 shows manner of driving sheeting with an air hammer. Compressed air was also used to operate a power hoist for pulling sheeting and for pulling scrapers used in backfilling trench. Figure 11 illustrates the handling of two lengths of pipe joined together by bituminous joint material. Figure 12 shows a joint being poured above the surface of the ground.

Figure 12. *Joint Being Poured Above the Surface of Ground*

PAVEMENT TROUBLES NEAR SEWER TRENCH

One unanticipated result developed during laying of the intercepting sewer, namely, the settlement and cracking of asphalt paving adjoining the trench. This cracking (See Figure 13) took place as far back from the trench as 10 to 15 feet. Every reasonable precaution had been taken against the possibility of this result through the use of close sheeting and driving the sheeting before the excavation was carried below the underside of the pavement. The full explanation of this phenomenon has never been entirely apparent. The most logical explanation is as follows: The fine sand through which the trench was cut, when dry, flows like the sand in an hour glass. The opening up of the trench and the lowering of the ground water level tended to cause the sand under the surface of the pavement and adjoining the trench to dry out. This, together with vibration of the air hammers used in driving the piling, caused the fine sand to flow through the close joints of the sheeting in sufficient quantity to undermine the paving for some distance back from the

Figure 13. *Cracking of Asphalt Paving Adjoining the Sewer Trench*

trench. While under strict interpretation of his contract the contractor was required to replace all damaged pavement, the engineers felt that inasmuch as he had taken every reasonable precaution in protecting the pavement, the city should pay at least a substantial part of this cost and final settlement was made upon this basis.

The sewage treatment plant and pumping station were built by the Hay-Weaver Co., of South Bend, Ind., at a total cost of $120,925.42, equivalent to about $5.38 per capita. The intercepting sewers were built by E. W. Krueger of Muskegon, Mich., at a total cost to the city of $72,190.45. The construction difficulties encountered rendered the latter contract unprofitable to the contractor. The sewage treatment plant and intercepting sewers were designed by Pearse, Greeley and Hansen of Chicago, Ill. K. V. Hill represented this firm as Resident Engineer throughout construction.

The Five-Day Week in Construction

IN response to the request of the National Association of Building Trades Employers, Builders Building, 228 N. La Salle Street, Chicago, Ill., through Executive Secretary E. M. Craig of Chicago, for information regarding the attitude of employers and workmen in the building industry respecting the proposed universal adoption of the five-day week for building trades mechanics, replies were received from 75 cities throughout the United States and Canada.

An analysis of the replies disclosed the fact that in most of the cities where contractors' associations exist the sentiment is almost unanimously against the inauguration of a five-day week. Resolutions have been adopted pointing out the reasons of the contractors against the shorter week, and announcing their determination to absolutely oppose the adoption of the five-day week.

The pioneers in this short week movement seem to be the painters, plasterers and lathers. The painters are recorded as having the five-day week in 17 cities, the plasterers and lathers in 16 cities, the bricklayers coming next with 7 cities, the plumbers operating in the same number of cities on the five-day week, while the electricians have only 5 cities to their credit and the carpenters 4 cities. There are 4 cities in which practically all the trades are working a five-day week; namely, Miami, Fla.; Atlantic City, N. J.; Portland, Ore., and Seattle, Wash.

Seven cities have reported that practically all construction work is done under open shop conditions and all employes are working on the five-and-one-half-day week basis. Eight cities have reported no demand for and no talk of any kind for the shorter week. One unique feature of the survey was that the five-day week was almost universal in union trades where it was reported that 60 per cent or more of the construction work was being done on the open shop basis.

More than 40 of the cities which reported are opposed to the five-day week and have gone on record in their respective communities and have given their reasons for opposing the same. Even in some cities where some unions have succeeded in putting the new idea over, the contractors as a whole deplore the fact and still persist that the five-day week proposition is void of any merit in its favor.

The general consensus of opinion as reflected in the reports is that the five-day week for the building industry is: against all principles of economy on construction work; that it will curtail the production of men; that it encourages idleness and waste of time; that it means for working men too much leisure and waste of income; that it is detrimental to the interests of all engaged in construction work; that it will mean increased cost of doing construction work; that it will prevent contractors from completing a job in a minimum time; that it will compel contractors to employ men at overtime rates to complete work; that it will discourage owners going ahead with contemplated structures; that the individual worker would prefer to work the longer week; that where no unions exist there is no demand for the shorter week; that the shorter week will not be a remedy for unemployment; that trades wanting the five-day week usually demand increases in wages to make up for the loss; that contractors have no confidence in the statement that men will not work on Saturday; that if they have to, men will work Saturday evening and Sunday and demand overtime; that no one has the right to curtail the earning powers of another; that with the loss of time by bad weather, workmen will not be able to average their usual weekly or annual income; and that the time, conditions and needs of the construction industry do not warrant any interference with the hours of employment by any one except the individual whose living, family, environment, progress and the education of his children warrant and justify him as an individual in adopting.

A Koehring 27-E Paver Owned by Oswald Brothers, Los Angeles, Calif., at West Avenue 41 *and York Boulevard. An Indiana 2-Batch Truck Is Shown Delivering Aggregate to the Skip. This Machine Was Sold by Harron, Rickard and McCone, Los Angeles*

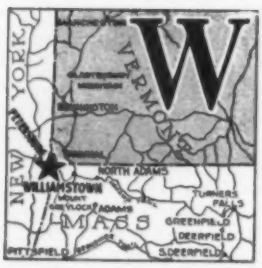
Leipzig Fair Dates Announced

THE Leipzig Trade Fair will be held this year from August 26 to September 1, at Leipzig, Germany. The Fair will attract buyers from forty-three countries, while a score of countries will send some 10,000 exhibits. America will send approximately 2,000 buyers and about fifty exhibits to this great world market place.

A Well-planned Road Job in Ledge and Gravel

By A. E. Dadley

Resident Engineer, Massachusetts Department of Public Works



WITH the opening of the new Petersburg Mountain Highway from Williamstown, Mass. to Petersburg, N. Y., the states of Massachusetts and New York have added a new link to the highway system throughout the unrivalled beauties of the Berkshire Hills of western Massachusetts. The new road is an extension of the Mohawk Trail. It leaves the newly laid out, but not yet completed road from Williamstown to Pittsfield and in 4¼ miles climbs the eastern slope of Petersburg Mountain to Petersburg Pass, 1300 feet above its starting point and at the same elevation as the western summit of the Mohawk Trail which is visible 14 miles to the east.

The summit is in New York as the Massachusetts-New York state line crosses the new road layout ¼-mile east of the pass. On the Massachusetts side of the mountain the ascent is gradual. The road winds along the side hill for almost its entire length allowing beautiful views of Williamstown and North Adams in the valley below with Mt. Greylock, the highest mountain in Massachusetts always in the background.

Planned by Beauty

The maximum grade on the Massachusetts side is 7 per cent and this maximum is maintained only for a distance of 3,000 feet. The minimum radius of curvatures is 500 feet with the exception that at the foot of the mountain at the junction of the Pittsfield-Williamstown road there are curves of 200 feet and 300 feet radii, these curves swinging respectively toward Williamstown and Pittsfield. At this intersection the State has taken a right-of-way of 100 feet on each side of the center lines of construction so that it will be impossible for abuttors to build close enough to the road to spoil the sight distance as designed when the road was laid out.

In fact, in planning the width of layout on the whole job, great care has been taken to see that the natural beauty of the country will not be spoiled by hot-dog stands, gasoline pumps and bill-boards. The width of the layout in the inaccessible side-hill locations is fifty feet on each side of the center line while in the few open spots where it would be possible to erect unsightly buildings or bill boards the layout is widened an additional 50 feet on each side.

Only Three Cross Roads

The new highway is an entirely new location and in Massachusetts is crossed by only three local roads. These local roads have grades above 20 per cent, are extremely ledgy, impassable with mud during the wet seasons, and are so narrow that it is necessary at times to back even a Ford car a half-mile to find a spot in which to turn around, or to pass another car. The spot located after the half-mile of reverse motion is by no means a safe and easy place in which to turn a Ford, but the turn can be accomplished if care is exercised to see that not more than one wheel is over the edge of the bank at one time.

One of these roads crosses the new location about 2000 feet from the lower end, the second crosses at about a mile from the lower end, and the third intersects the location 1½ miles from the line and roughly parallels the new road to the New York line. The two lower roads are passable to automobiles and trucks except during the Spring of the year and were used by the contractor during construction. The upper road was not used during construction as it is impassable to anything except horse drawn equipment, Ford cars or tractors.

The upper road was, however, used by the state engineers during the preliminary survey work and the staking of the job. All of the state's Ford cars which had occasion to use this upper road were equipped with Ruxtell axles as otherwise it was necessary to reline the transmission bands after three or four trips up the mountain.

Lack of Water

A serious draw-back to the job on the Massachusetts side was a lack of water due to the fact that on most of the work the strata of the ledge lay away from the road. Water was accessible at only two points on the upper 3½ miles of the work.

At 1¾-miles from the upper end, there was a small artificial ice pond fed by springs and 3 miles from the upper end there was water which had been piped to a farm-house from a spring half-a-mile away. The lower half-mile of the job more than made up in number of springs for the lack of them at the top of the mountain.

Items of Contract

The main items of the contract were 98,000 cubic yards of earth excavation, 42,000 cubic yards of ledge excavation, 3,000 feet of 12-inch and 18-inch cast iron pipe culverts, 300 feet of 30-inch reinforced concrete pipe culverts, 30,000 cubic yards of gravel borrow, 21,000 cubic yards of stone fill, 300 cubic yards of reinforced concrete cribbing, 300 cubic yards of reinforced concrete masonry, 200 cubic yards of plain concrete masonry, 30,000 feet of stock fence, 9000 feet of cable guard rail and 24 acres of clearing and grubbing.

The contract completed in the Fall of 1927 was for grading, drainage, foundation, and temporary gravel surfacing. While this work has been finished and the road opened to traffic, the project is not completed as it has not been paved. Due to the amount of side-hill filling, the depth of these fills, and the impossibility of

satisfactorily compacting them it was decided to defer the macadam surfacing for a year or two.

ALL EQUIPMENT GASOLINE POWERED

The Richard Hopkins Co. of Albany, N. Y., was awarded the Massachusetts contract for construction in September, 1926, at a price of about $300,000.00 while S. B. Van Wagner was the contractor on the New York side of the mountain. Because of the inaccessible nature of the work and the inability to obtain water Mr. Hopkins decided to use gasoline-powered equipment on the upper 3 miles of the work. With this point in view he purchased new equipment including a 1-cubic-yard Gas + Air Erie shovel, a 10-ton Buffalo-Springfield gasoline roller, an Ingersoll-Rand compressor, and a Sullivan drill sharpener.

CONSTRUCTION CAMP

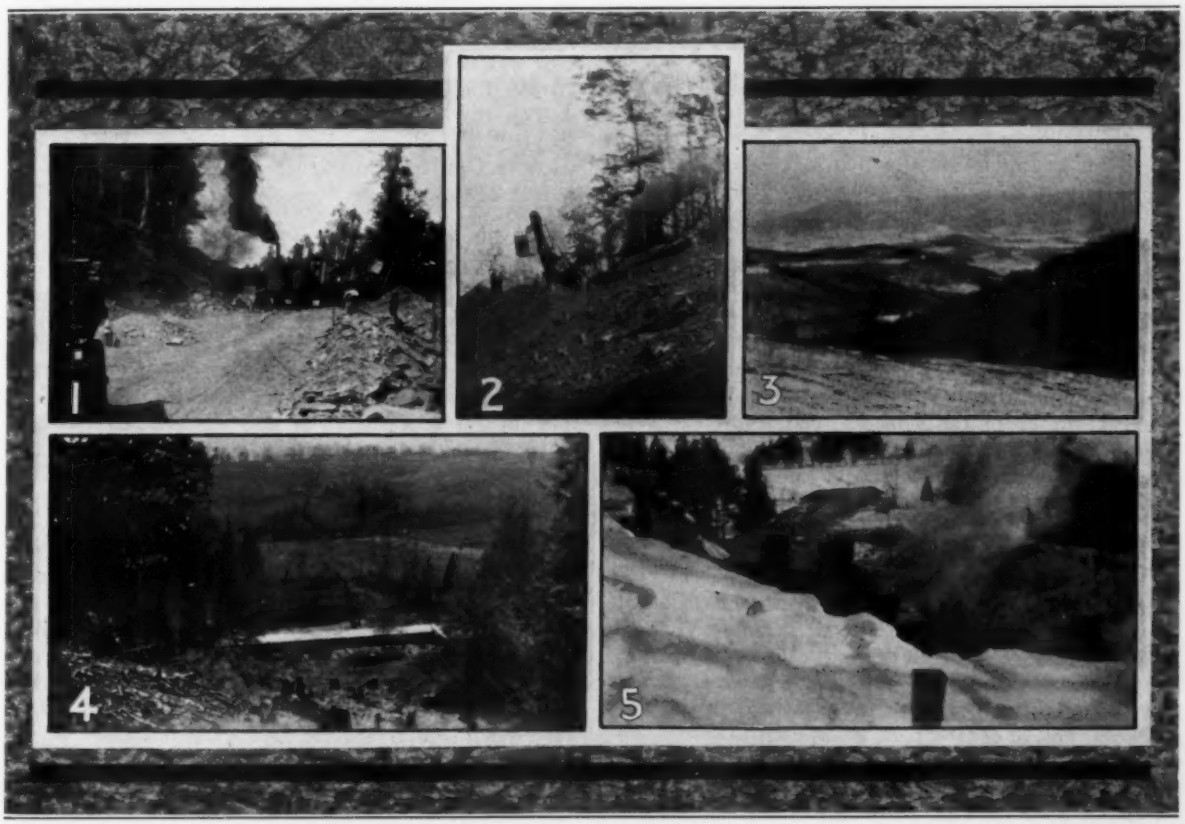
The contractor leased a large farm house with its connecting barns and about 30 acres of land on the Bee Hill Road, which crossed the new location a mile from the lower end. A man and his wife were installed as camp boss and cook. In this building lived the foremen, mechanics, truck drivers, and teamsters. The barns were fixed up to accommodate 20 horses. A camp for about 50 men was built a quarter-of-a-mile away to house the foreign labor. The laborers bought and cooked their own food.

WORK IN LEDGE

Work was started just above the Bee Hill Road, with the Erie shovel. The work from this point to the New York line ran about 70 per cent ledge and was mostly side-hill cutting with a great deal of side casting. The job had a waste of about 17,000 cubic yards, but the contractor planned to use some of this excess ledge as stone base so that the work was carried on so as not to waste any more of the ledge than could be avoided. The gas shovel on its first trip up the mountain made no attempt to make a finished job of excavating but simply followed the grade line along the hill side making a narrow road-way for itself and the teams and trucks.

When work first started in the Fall of 1926, due to some wet weather, the teams were used to somewhat better advantage than the trucks, until the ground became frozen. The contractor, for his trucking equipment, used 3½-ton Autocars with pneumatic tires. Besides six of the Autocars he had two 5-ton Whites. The Whites were used on the few long hauls necessary and the Autocars on the short hauls where the short turning radius and tractive ability was an advantage.

On the first trip up the mountain, the shovel stripped



CONSTRUCTION WORK ON THE PETERSBURG MOUNTAIN HIGHWAY IN WESTERN MASSACHUSETTS

1. The 8,000-cubic-yard ledge cut located 1¾ miles from the upper end of the job. 2. Big side hill cut at the location of the curb wall during excavation. 3. View of upper 1½ miles of the project on the Massachusetts side of the mountain. This photograph was taken from the summit of the pass. The location of the road after clearing was completed may be seen following the side hill at the left center of picture. 4. View at lower end of the project from the top of the 20,000-cubic-yard cut, showing the location of the 15,000-yard fill. The 12 x 6-foot box culvert, 97.5 feet long, is shown in the center at the location of the fill. 5. View from the top of the 20,000-yard cut, showing the same location as in 4 after the completion of a major portion of the fill

off whatever ledge could be conveniently reached. Some of this stripping had to be wasted, as a large amount of it contained the roots of the heavy growth which had been cleared and burned ahead of the shovel. Much of the ledge was so soft that it could be readily excavated with the shovel without blasting. When hard ledge was encountered a row of holes was drilled, the holes sprung, heavily loaded and blasted. Usually one or two rows of holes along the hillside treated in this manner were sufficient to open up a road for the shovel.

When a deep gulley was encountered the shovel cut a roadway up to the gulley then turned back and widened the cut until enough material was obtained to make a narrow roadway across the gulley.

CUTTING TO FULL WIDTH

As the shovel worked ahead it was followed by a gang of men with teams and scrapers which stripped off clean, any of the hard ledge which it was decided to save for stone base. These were followed by a second compressor and crew. The ledge was drilled and the holes plugged. After the shovel reached the upper end of the job it turned back and cut the width of the roadway, and in soft ledge, back to the ditch line. The ledge was shot just ahead of the shovel so as not to block the road for the rest of the outfit.

FINE GRADING

At this time fine grading was started behind the shovel. The only gravel available was at the lower end of the job. As the soft ledge stone would make a satisfactory drain under the stone base it was decided to allow the contractor to use this soft ledge to replace the 6-inch layer of gravel which was called for under the 12-inch stone base. The soft ledge stone was used in this manner on the upper 2½ miles of the job thus saving a long uphill haul of gravel and greatly increasing the speed of the work.

The fine grading was followed closely by the 6-inch layer of soft ledge stone, this material being carried back from the shovel whenever any clean soft ledge stone, satisfactory for this purpose was encountered. After a stretch of the subgrade and soft ledge stone base had been completed, the shovel moved into a hard ledge, cut and sent back the 12-inch layer of stone base, thus carrying on the three operations simultaneously.

QUARRYING OPERATIONS

As there was not enough of the hard ledge for the stone base within the slope lines it was necessary to quarry material in back of the slope lines. This was done by widening the ditch and back slope, parallel with the road rather than quarrying a large amount in one spot. The material thus taken in back of the slope lines was not, of course, paid for as excavation.

STEAM SHOVEL STARTS WORK

Shortly after the Gas + Air shovel first started work a 1-yard Erie steam shovel began work about a half-mile further down the hill and worked its way up to the starting point of the Gas + Air shovel. This half-mile was on a gently sloping side-hill in open farming land, was practically all side casting, and was the easiest section of the job.

As soon as the steam shovel had completed this cut it went back the half-mile and started working downhill on a very heavy side-hill cut in a hard gravelly material almost approaching hard pan. It was in this side-hill cut that the concrete cribbing was located.

HARDEST JOB SAVED FOR FREEZING WEATHER

By the time the side-hill cut was completed the ground was frozen hard enough to start the largest cut on the work which was located at the lower end of the job. This last mentioned cut was of about 20,000 cubic yards and was a through cut with a maximum depth of 24 feet. The material was a very hard clay containing thin layers of gravel and was full of springs. Because of the frozen ground, little difficulty was encountered.

About 15,000 cubic yards of the material from this cut were used in an adjacent fill down-grade from the cut. The remaining 5000 cubic yards were used on the lower end of the job requiring a haul of not more than half-a-mile.

BOX CULVERTS

As soon as the contractor started work in the Fall of 1926, he constructed three large concrete box culverts which were required at the lower end of the job. Two of these were of 12-foot span by 6-foot depth of opening and the third was of 8-foot span by 5-foot depth of opening. One of the 12- x 6-foot culverts was 97½ feet between endwalls, the other 12- x 6-foot culvert was 44 feet long and the 8- x 5-foot culvert was 70 feet long. The 12- x 6-foot culvert 97½ feet long was in the 15,000-cubic yard fill, there being an 18-foot depth of fill over the top of the slab. The box culverts had all been constructed and had cured the required 28 days before filling was started.

THE 15,000-CUBIC-YARD FILL

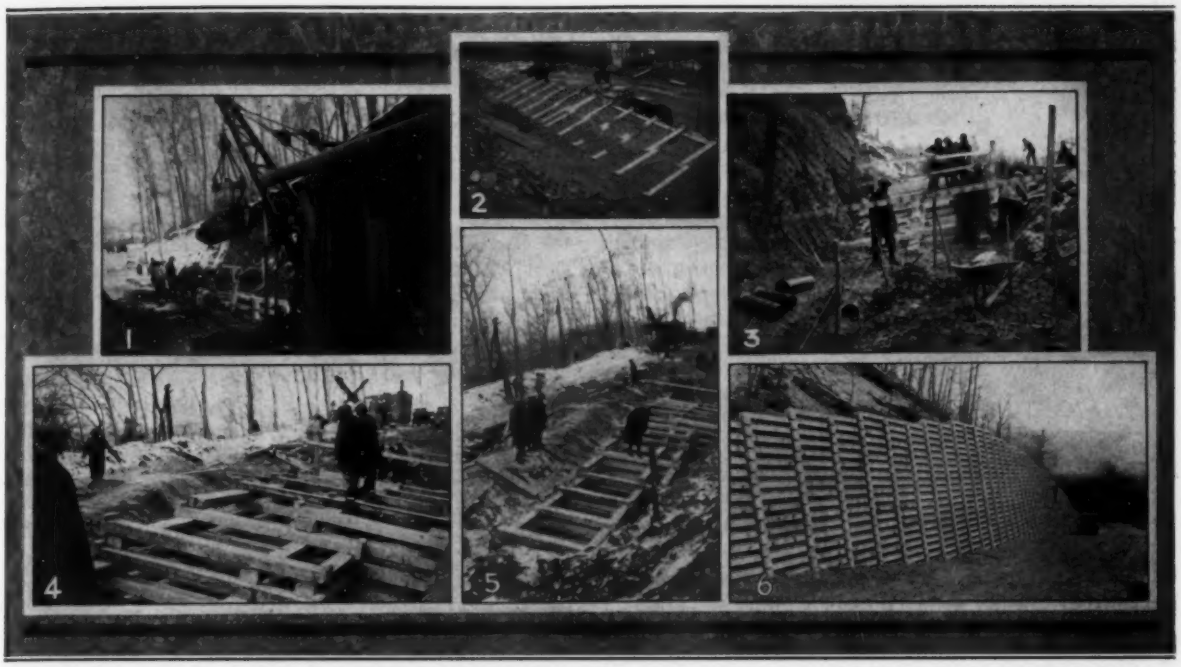
The 15,000-cubic-yard fill was made with 3½-ton Autocar trucks. The fill was started by back dumping from the edge of the cut. A narrow roadway to the bottom of the fill and at as steep an angle as the trucks could climb when empty, was constructed. From then on the fill was brought up in layers of about 2 feet. The fill was kept leveled off and was trucked over continuously but was not required to be rolled.

THAWING HOLDS UP JOB

The only hold-up on the job occurred in making the 20,000-cubic-yard cut. Spring came and the frost started to leave the ground before the cut was quite completed. After several unsuccessful attempts to keep going in the mud by using 3-inch hard wood planking used as a corduroy road the steam shovel was shut down for three weeks until the cut dried out. Tile drains were used in the worst mud holes and helped very much in hurrying the drying out process.

GRAVEL OPERATIONS

After the cut dried out and the excavation was completed, the steam shovel moved into a gravel pit located on the Pittsfield-Williamstown Road, about half-a-mile from the lower end of the job. The 6-inch gravel base on the lower half-mile was laid and the 12-inch foundation of stone base was started. The stone for this portion of the road was field and wall stone and was teamed to the job from nearby fields.



CONSTRUCTION OF THE MASSEY CONCRETE CRIB WALL ON THE PETERSBURG MOUNTAIN HIGHWAY

1. Bottom of the crib wall soon after work had started. The Universal truck crane was used for excavating, laying the unit and backfilling the wall with gravel as shown in the foreground. 2. Backfilling the wall with gravel. This picture shows the 11-foot thickness which was used at the bottom of the high section. 3, 4 and 5. Various stages in laying of crib members. The upper end of the wall is on a 1,200-foot radius curve, as well as on a 6½ per cent grade. 6. The complete crib wall

The steam shovel then moved to the second gravel pit which was located by the roadside near the contractor's camp. The gravel base from the 2½-mile to 3½-mile points was put on from this pit. The 3½-ton Autocars and the 5-ton Whites were used for laying the gravel base.

SUBBASE

When this stretch of gravel base was complete, the steam shovel moved up the mountain to a point about 2¼ miles from the New York line and started excavating the hard ledges which had been stripped and drilled preparatory to use as stone base. This stone filling was trucked down-hill to the 3¾-mile point and the stone base laid.

The rolling of the subgrade, gravel base, and stone filling was done by a 12-ton Buffalo-Springfield steam roller on the lower 2 miles, while the 10-ton Buffalo-Springfield gas roller was used on the upper 2 miles.

The two shovels were now working toward each other. When they met and had completed the stone base they were put back in the gravel pits and the 3-inch temporary gravel surfacing started. As soon as the Gas + Air shovel had completed the gravel surfacing on the lower half-mile of the work it was loaded and shipped to another job. The steam shovel completed the gravel surfacing. On the long haul of gravel surfacing to the top of the mountain additional trucks were hired for about two weeks.

REINFORCED CONCRETE CRIBBING

The most interesting feature of the entire job was the Massey reinforced concrete cribbing, some views of which are shown herewith. The crib wall is located in the big side-hill cut about one-half mile from the lower end of the job. The slope of the original ground was 1½:1, which is the same as the required cut slopes in earth in Massachusetts. The wall has a maximum height of 23 feet 5 inches above its base, which is 2 feet below ditch grade, and is 290 feet long. It has a depth or thickness of about 11 feet at the bottom of the high sections.

A Universal truck-crane with ½-yard clamshell bucket was used to complete the excavation for the crib. Most of the excavation was done with the steam shovel but, because of earth slides it was necessary to use the crane to keep it cleaned out and also to remove slides on top of the crib members which were being laid.

The cribbing was laid on an excellent natural foundation of hard-packed gravel and for part of its distance on ledge. A 6-inch tile drain under the back of the wall was used to provide drainage. As the wall was on 6½ per cent grade the bottom members were stepped up one course every two or three panels to follow the grade line.

Both the header and stretcher units are 6 feet long. The 11-foot thickness of wall used on the high sections was obtained by using two 6-foot headers overlapping about 1 foot. The face of the wall has a batter of 1 foot in 6 feet.

PERSONNEL

C. L. Hill, Jr., was superintendent for the Richard Hopkins Co. The work was performed under the direction of Geo. A. Curtis, District Engineer of the Pittsfield offices of the Massachusetts Department of Public Works, with the writer as resident engineer.

Cost Data on a Railroad Grading Job

Gasoline Shovel Averages 1,375 Yards Daily on 35,100-Yard Job for Railroad at Cost of 2.18 Cents a Yard

ON a job involving the handling of 35,100 yards of material averaging 65 per cent loose rock and 35 per cent dirt, the R. H. Taylor Co., Linden, Ala., established some interesting cost records. The work was on a 5-mile stretch of grading on the Aberdeen-Kimbrough extension of the Frisco Lines. The extension totaled 151 miles and was split up into a number of sub-contracts.

The section handled by R. H. Taylor was located 18 miles from the rail head at Linden, Ala. A Lorain-75 was run out to the work from Linden over 9 miles of gravel and 9 miles of dirt road which had been made almost impassable by a period of heavy rain. It was necessary to by-pass culverts in several places, going down over the side of the road, through bog holes and back up onto the other side. High speed operation was not attempted and frequent stops were made to see that everything was working smoothly. The entire trip was made in 36 hours, using low speed only, under what was generally admitted to be extremely difficult conditions.

The shovels started work on the job at noon on July 19, 1927. The material in the cut included a little solid rock in with loose rock and dirt and the shovel handled the entire 35,100 yards, bank measurement, in 281 operating hours. This is equivalent to 25.5 11-hour days of actual work and the total time, including Sunday shut-downs and time lost for track shifting, was about 33 days.

The shovel carried a 21-foot boom, a 16-foot dipper stick and a 1¼-yard dipper. The dragline equipment on the job consisted of two P & H outfits and the hauling was handled by two 8-ton Plymouth gasoline locomotives, each pulling a 9-car train of 4- and 5-yard cars. The shovel worked with lifts of 7 to 15 feet to the cars, the swing varied from zero to 180 degrees and the average was about 90 degrees.

High Daily Production Record

The high record for daily production was made on August 13. The Lorain-75 loaded 702 cars with an average of 3 yards each in 11 working hours. The shovel handled 2,106 yards, averaging 50 per cent loose rock, with a lift of about 8 feet to the cars. The loading of a 9-car train averaged 6 minutes throughout the entire job and it appears from this that the shovel was actually loading for only 71 per cent of the total time on the day the record was made.

Operating Costs

The comparative operating costs of the Lorain-75, a 1¼-yard shovel, and a ¾-yard gasoline shovel which the R. H. Taylor Co. had used on another almost identical job are given in the accompanying table. These costs include fixed charges on the two machines, repair and maintenance allowances, fixed by experience at $700 per year and the usual daily operating charges such as labor, gasoline and lubricants. The cost for the 1¼-yard shovel was $30.01 a day and for the ¾-yard shovel $26.35 a day.

COMPARATIVE OPERATING COSTS ON GASOLINE SHOVELS

Shovel Considered		Lorain: 75	¾-yard type
Investment (first cost and freight)		$14,350.00	$11,000.00
Annual Fixed Charges			
10-year amortization		1,435.00	1,100.00
*Average interest @ 6%			
11/10 x investment x .06/2		473.55	363.00
Maintenance and repair allowance		700.00**	700.00
Total annual fixed charges		$2,608.55	$2,163.00
Daily Operating Costs			
Fixed expense—250-day basis		10.43	8.65
Labor—Operator	$9.00		
Helper	3.30	12.30	12.30
Gasoline at 18c per gallon		6.30	4.50
Lubrication—oil and grease		.98	.90
Total daily operating costs		$30.01	$26.35
Unit Shovel Costs			
On average daily output of Lorain-75 $30.01 ÷ 1,375 yds./11-hour day		$0.0218/yard	
On best daily output of ¾-yard unit $26.35 ÷ (15,000 yd./25 days)			$0.0439/yard

* Allowing for interest earned by depreciation reserve.
**Actual repair parts cost to date averages less than $500 per year on the Lorain-75.

Comparison on the output basis is of interest. The best month's work on the ¾-yard shovel was 15,000 yards and the average daily output was 600 yards. The cost was 4.39 cents per yard compared with the 1¼-yard shovel's figure of 2.18 cents a yard.

Savings Affected

The second table shows the savings effected by the 1¼-yard shovel. The net saving compared with the cost of the ¾-yard shovel is 2.21 cents a yard or 50.3 per cent. For the total of 35,100 yards handled by the 1¼-yard shovel on the Frisco job the saving was $775.-

A Lorain-75 Owned by the R. H. Taylor Co., Operating on the Frisco Grading Job at Linden, Ala.

71, which was effected in slightly more than one month.

TABLE B—SAVINGS EFFECTED BY LORAIN-75 SHOVEL

Saving per average yard ($0.0439—$0.0218)....	$0.0221	50.3%
Saving on Frisco job—		
$0.0221 per yard x 35,100 yards.....		$775.71
Saving per year (estimate based on average Lorain-75 output of 1,375 yards per day for 250 days per year.)		
$0.0221/yd. x 1,375 yards x 250 days.....		$7,596.88
Annual returns on investment:		
On total for Lorain-75.....		53%
On added investment in Lorain-75 ($3,350)		226%

The 1¼-yard shovel which has been in operation for six months lost only one-half day's time. The repair parts cost during this time, including all parts shipped with the machine and since that time as spares, totals $367.34. Less than $250 worth of these parts is actually chargeable against the first six months of operation and the annual allowance of $700 allowed in the first table is more than enough to cover the item.

The Heavy-Duty North Hydraulic Digger Owned by John D. Exterkamp, Covington, Ky., Handling an Average of 150 Yards of Hard Clay a Day on Street Grading Job

Airplane Hangar Construction

THIS is the title of a publication recently issued by the National Lumber Manufacturers Association, Transportation Building, Washington, D. C., in response to a widespread demand for detailed information on the establishment of airports and hangar construction. The booklet has been prepared by the engineering department of that association. Complete working drawings, bills of materials and estimated costs are given for four types of hangars, ranging from the single plane size to the large municipal type hangar. Such problems as doors, heating plants, fuel economy, roof trusses, roofing materials, and drainage are discussed in detail.

With aviation opening up a new field of construction, contractors should find this publication for use in informing them of costs, ways and means of constructing hangars. The booklet demonstrates that modern hangars are available for all municipalities at costs considerably below those paid by the larger pioneering cities in airport development. In the course of preparation of the publication, the practice of numerous air fields was canvassed and the opinion of army and other officials experienced in airport operation was obtained. Copies are available on application to the Association.

Manufacturers' and Distributors' Day Planned for Road Show

IT has been proposed to designate Saturday, January 12th, as Manufacturers' and Distributors' Day at the 1929 Road Show at Cleveland, Ohio. The general opening of the Road Show will be on Monday, January 14th.

Reconstructing a Sand and Gravel Plant

By W. D. Polk

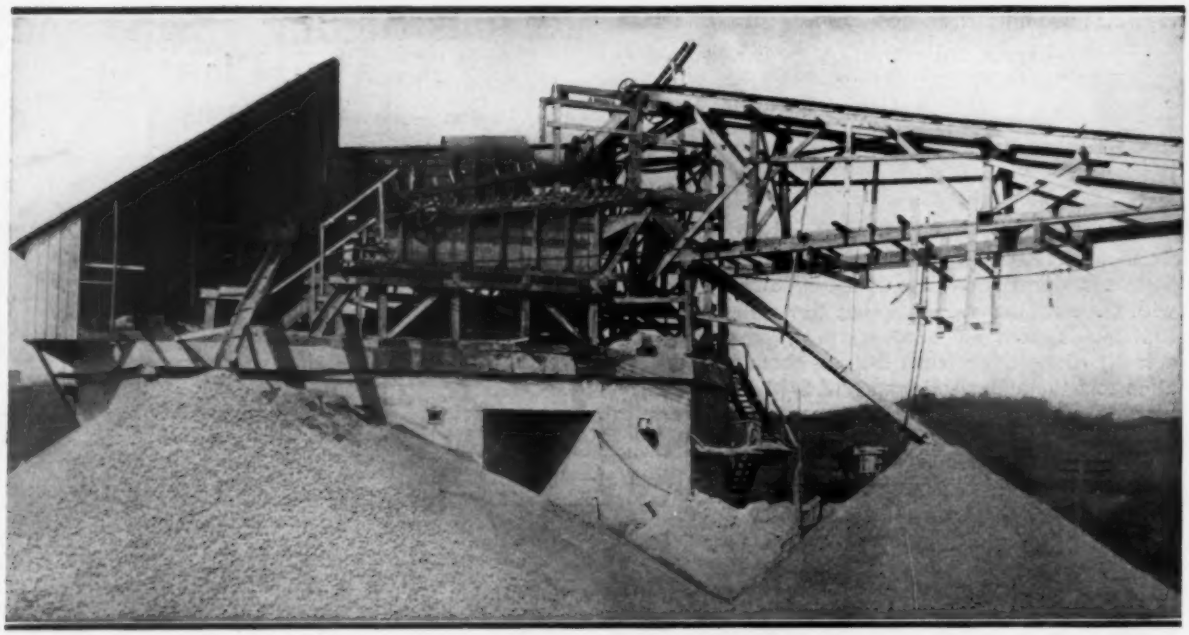
THE Beaver Sand and Gravel Co., of Beaver, Pa., operated a sand and gravel plant with a slackline cable excavator for a number of years with a tower on top of the material bins. The old plant was purchased from an eastern concern which at that time made aerial and power scraper buckets. The operation was so expensive and caused so much trouble that the Beaver Sand Co. officials decided to either purchase some other type of plant or discontinue business. Their sand pit was a dry one.

In January, 1927, a number of manufacturers was asked to submit plans in competition for the reconstruction of this sand and gravel plant. The bid of the Good Roads Machinery Co., Kennett Square, Pa., was not the lowest, but was accepted because it seemed to have the best plant arrangement.

After the order had been placed for the new plant, the Beaver Sand and Gravel Co. dismantled the old plant entirely with the exception of the material bins which were of the concrete and silo type. Nothing was retained in the machinery line with the exception of a No. 5 Champion crusher, a Champion elevator and the electric hoist which was made over.

The old sand and gravel pit bottom had been worked to a depth of 60 feet below the ground level of the material bins and railroad tracks. In the new plant a steel hopper of 20 tons capacity was placed in the bottom of the pit. A Sauerman dragline scraper was purchased and is now operated by the reconstructed electric hoist, all placed on the same level as the top of the hopper in the pit. Material passing through the hopper is carried by an apron feeder to a 30-inch belt con-

The Beaver, Pa., Sand and Gravel Plant, Showing the Sauerman Scraper in the Foreground and the Conveyor Leading to the Screening and Washing Plant



The Final Screening Unit of the Beaver, Pa., Sand and Gravel Plant

veyor 340 feet long running from the bottom of the pit to a 48-inch heavy-duty scalping screen at the crusher house which is on ground level. Material passing through the perforations of the 48-inch scalping screen is carried by means of the 18-inch conveyor 156 feet long to a heavy-duty 48-inch finishing screen on top of the material bin. Material passing out the end of the scalping screen is stored in a small bin.

When this bin is full the oversize material is fed to the No. 5 Champion crusher by gravity through a bin gate and chute, thus, the crusher is only operated when there is enough material stored to keep the crusher working to full capacity. Under the circumstances, more uniformly crushed material is secured and at the same time the greatest economy is reached. A clutch on the countershaft takes care of the crusher drive.

The crusher material is carried by an elevator to the same scalping screen as the material from the pit. This arrangement makes what is termed "a closed circuit." In other words, full control of the material going to the finishing screen on the top of the material bin is secured by the introduction of the crusher house. Perhaps a word of explanation for the closed circuit and crusher house would be in order. By passing all material from the hopper through a scalping screen, then crushing the oversize and returning it to the same screen for re-screening, almost perfect control of the sizes for the finishing screen are obtained. If fine sizes are wanted, it is only necessary to change the size of the perforations in the scalping screen and keep on with the cycle of operation.

Two wash boxes on the material bin give the necessary grades of sand. Three men and a superintendent operate the plant which has a capacity of 500 tons in 10 hours.

The Arc-Welded Railroad Bridge at Chicopee Falls, Mass.

WHAT is believed to be the first railroad bridge in the world to be erected by the arc-welding process is that which carries the Boston and Maine Railroad over the canal at Chicopee Falls, Mass. There are no rivets or bolts in the bridge. It is practically a one-piece structure, built by fusing the various members together at their joints by means of the intense heat of the electric arc. It has been built by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

A saving of approximately 33 per cent of the tonnage of steel required was secured by this method of construction. The size of many of the truss members, connecting parts, and floor stringers was reduced and yet strength equal to that of an equivalent riveted job was provided, since there was no weakening due to rivet holes. A considerable amount of connecting parts and lattice bars, needed for riveting, was omitted. Time in fabrication in the steel shops was saved because of the lack of rivet holes to be laid out and drilled, and a smooth surface made painting easier and reduced the possibilities of rust. Objectionable noise during construction was eliminated.

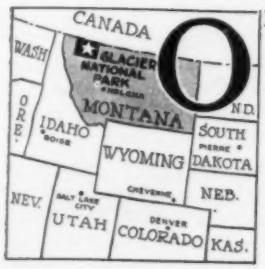
Electric Welder at Work on Chicopee Falls Bridge

In the article "Constructing 2½ Miles of Storm Water Drain" by O. Bonney, which appeared on pages 409 to 414 of the June issue of CONTRACTORS AND ENGINEERS MONTHLY, two photographs, one at the top of page 412, the other at the bottom of page 413, were wrongly included with the other photographs in that article.

Another Montana Mountain Road Job

By R. L. Ewing

Resident Engineer, Montana State Highway Commission



ONE of Montana's outstanding highway jobs is the completion of the Blackfeet Highway which involves Projects Nos. 226 and 227 which were let to W. E. Applegate, contractor, of Butte, Montana, in the early Spring of 1926. This contract included the grading, surfacing and small drainage structures, the contract for the bridges being let to McQuire & Blakeslee, of Great Falls, Mont. These projects total 37 miles.

The Blackfeet Highway has its beginning at the Roosevelt Highway at Glacier Park Station, the eastern railway entrance to Glacier National Park and extends northerly a distance of 54 miles to the Canadian line, where it joins a gravel highway leading into Cardston, Alberta, a distance of some 16 miles. At that point a road branches west to the Waterton Lakes country and almost north to MacLeod, Calgary, Banff, Edmonton and other Canadian points of interest.

Two stretches of this highway were completed in the early Spring of 1926, one section of 6 miles known as project No. 210 or the Divide Creek Hill section, beginning at the summit of the Hudson Bay divide and winding down the mountains on a 5 per cent grade to the upper end of the lower St. Marys Lake. This section was built by Walter Hill, contractor. The other section, known as Project 208, or the Babb-Cardston Section, began at the town of Babb and extended north to the Canadian line, a distance of 11 miles and was under contract to Lalonde, Peck and Powers.

The Applegate contract begins at Glacier Park station on the Great Northern Railway and extends north to a connection with Project No. 210 a distance of 29 miles and also that section between Projects 210 and 208, a distance of 8 miles.

Good roads branch off of this highway, leading into the Park at different points of interest. At a point 4 miles north of Glacier Station, the Government has just completed a modern graveled road leading into the Two Medicine Lake country; at about 17 miles north, a good road leads into the Cut Bank Chalet; at 35 miles north, a good road leads into the St. Mary Chalet, about 2 miles distance from the main highway; also at this point, the Logan Pass Highway, which is being built across the Main Rocky Mountain Range,* will connect when completed. Branching off at Babb, the Government is at the present time building a modern graveled highway into the Many Glacier Chalet, a distance of about 14 miles, from which there are many points of interest.

* See the May issue of CONTRACTORS AND ENGINEERS MONTHLY for a description of the problems encountered in the construction of the Logan Pass or Transmountain Highway.

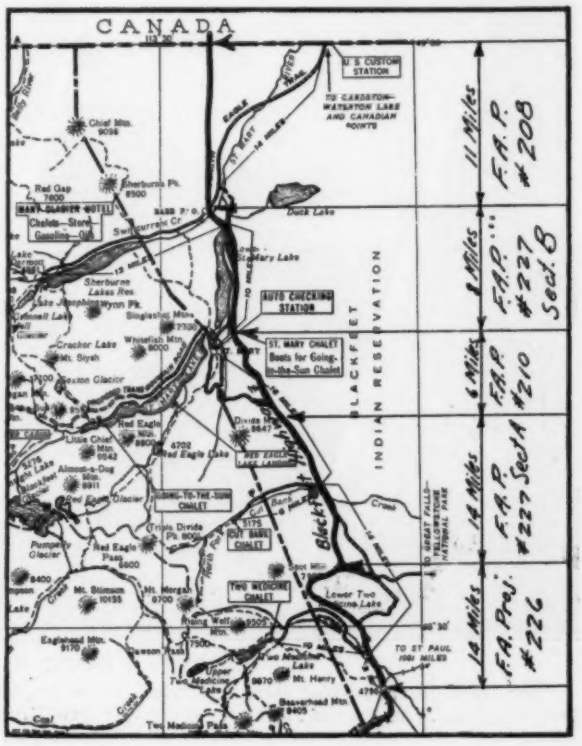
TYPE OF CONSTRUCTION

The Blackfeet Highway is being constructed to the highest standard of highway building of the mountain type and with grades crossing the high divides which will not exceed 5 per cent. It will be a great boon to automobilists who will be relieved of the sharp curves and steep grades, running to 12 per cent at some points on the present old road. The new highway will have a maximum curvature of 28 degrees on all outside curves around points of hills, all curves being widened and super-elevated.

The roadbed is being graded to a width of 30 feet in through cuts, including the ditches, and to a width of 24 feet shoulder to shoulder on through fills, with a crushed rock surfacing 18 feet in width, 8 inches thick, and having a base course which will pass a 1¼-inch screen and a top course which will pass a ¾-inch screen.

BRIDGES

The bridges consist of a 66-foot concrete arch span across the Two Medicine River, one 20-foot concrete arch span across Lake Creek and one 30-foot concrete arch across the south fork of Cut Bank Creek, a standard 90-foot pony truss across the north fork of Cut Bank Creek, a 20-foot arch across the south fork



of Milk River and three 66-foot concrete arch spans across the St. Marys River, just below the lower end of the St. Marys Lake, the smaller bridges being faced with rubble masonry to give a more rustic effect in keeping with the scenery of the region. All bridge work was practically completed last season. The grading should be completed in 60 days this season, but it will take all season to complete the surfacing.

PREPARATIONS FOR CONSTRUCTION

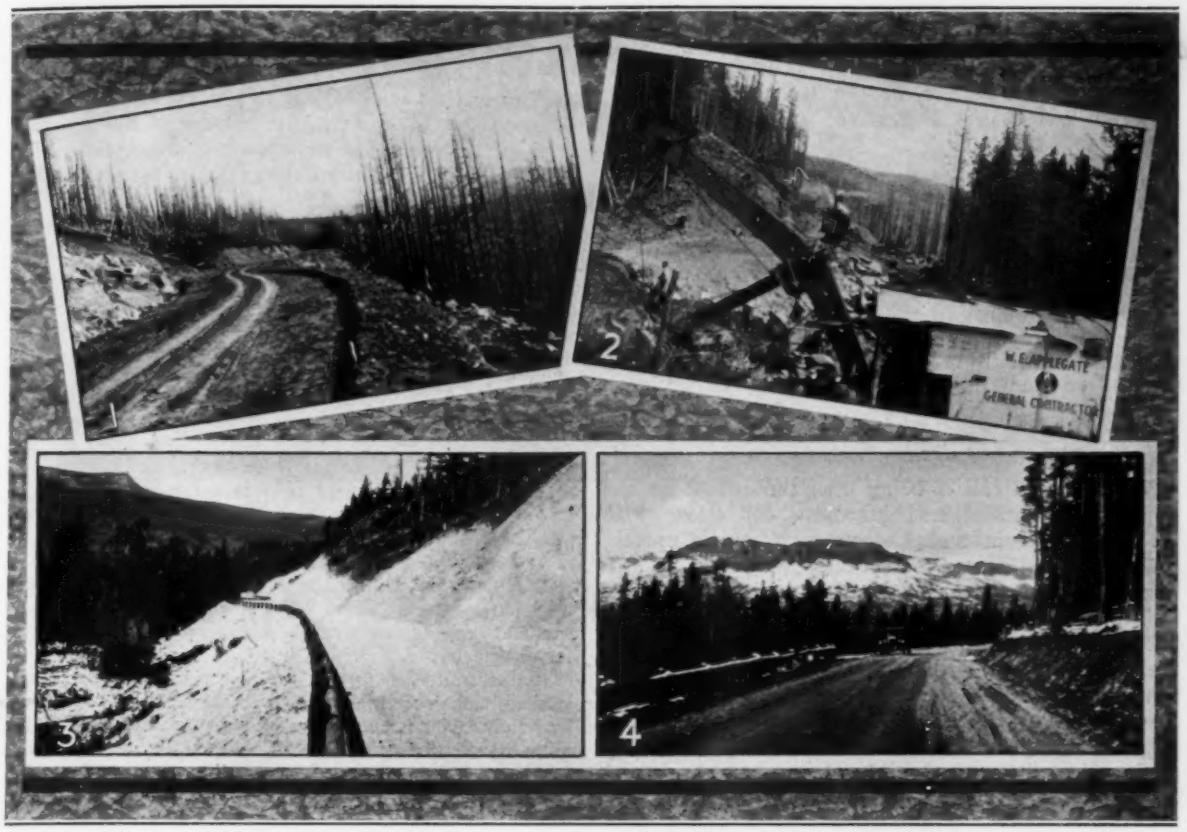
Projects 226 and 227 were located during the late season of 1925 and construction has been going on during the past two seasons. The working season is short in this locality, consisting of about 90 possible working days. Being a glacier drift formation, many difficulties were encountered in the way of slides, etc.

All construction operations were closed down for last season on November 12, 1927, due to severe winter weather conditions. Work was resumed late in April, 1928.

A general headquarters office and warehouse was established by the contractor at Fort Browning station, on the Great Northern Railway, in the early Spring of 1926. A good graveled highway, leading from this point to the end of Project No. 226, which is where the highway north from Browning intersects the present old road, a distance of 10 miles, greatly facilitated the handling of equipment, materials, and supplies to the work. As this work all lies away from the railroad, all necessary equipment, materials, and supplies had to be

INTENSIVE WORK ON BLACKFEET HIGHWAY

1. Erie steam shovel working ahead of Station 688 on Project 227. 2. Dumping fill beyond the casting limits at Station 412 on Project 226. 3. Project 226 on the route over Two Medicine Ridge looking ahead from Station 379. 4. A diesel-powered shovel pioneering on Project 226



THE BLACKFEET HIGHWAY DURING CONSTRUCTION AND COMPLETED

1. Project 226 looking back from Station 336 ready for surfacing. 2. The same project looking back on line from Station 379 during grading operations. 3. Project 210 near the bottom of Divide Creek Hill on a five per cent grade. 4. The same project complete, showing a completed section with Single Shot Mountain in the distance

hauled from 12 to 40 miles. The present old Park road came in handy for the work north, on Project No. 227, but for the work on Project No. 226, where most of the heavy work lies, only old Indian wood roads were available to haul over in establishing camps and getting the work started.

CLEARING

The first actual work started was that of clearing the right-of-way of all brush and timber, and for this work Indians of the Blackfeet Reservation were employed almost exclusively. They lived in tent camps that were moved along as the work progressed. All brush was piled and burned, the larger timber being decked along the right-of-way, to be used by the Indians for fire wood. It was necessary to keep a careful watch of burning operations lest the fire should run into the adjacent timber, this being a very dry season. I might add here that Blackfeet Indians have been employed throughout the whole construction in different capacities, such as laborers, teamsters, truck drivers, etc.

EQUIPMENT

Construction Camp No. 1 was established on the south side of the Two Medicine ridge, about 5 miles north of the beginning of the job and where the heavy shovel work commenced. An 18-B Bucyrus steam shovel was started working north over the ridge from this camp on June 17, 1926.

Camp No. 2 was established on Lake Creek on the north side of the ridge, and a 30-B Bucyrus diesel shovel was started July 3, 1926, working south out of this camp, back over the ridge toward Camp No. 1. In the Spring of 1927, a new Erie shovel was started out of this camp to help out the other two shovels, the diesel being used to pioneer ahead for the Erie. These camps were later moved farther up the ridge on each side as the work progressed. An Ingersoll-Rand compressor worked out of each camp, supplying compressed air for drilling operations wherever necessary. As the work was mostly side hill construction, "Coyote" holes were used on some of the larger cuts. Ford trucks, equipped with 1-yard dump-bodies, were used for hauling units in making hauls away from the shovels.

Camp No. 3 was established on Section "B" of Project 227 and a No. 28 Marion shovel was started at the beginning of this section on July 10, 1926. This shovel only moved about 7,000 cubic yards of excavation, when it was put in the discard and a new Erie was put in to take its place on October 16. When the shovel work was completed on this section, the Erie was moved down to Section "A" to do the heavy work.

Team camps, running from 16 to 40 head of stock each, were established at different points along this job, to expedite the grading and do those portions which were deemed too light for the shovels. Fresno scrapers were used almost exclusively. A Sixty Caterpillar, working with a 12-foot blade grader, and a Thirty

Caterpillar, working with a 10-foot blade, were put on the work during the 1927 season to work on finishing and light grading.

MATERIALS

Concrete culvert pipe was used exclusively on this contract. The pipe was made by the Spokane Cement Pipe Co. at their Spokane plant, shipped in, and distributed from Glacier and Fort Browning. This firm also sub-contracted the installation of the pipe and the building of concrete headwalls. Distributing the pipe along the line, ahead of the grading, along steep mountain hillsides, was no small job. Sand and gravel for concrete material for culverts, headwalls, and bridges, was all secured from local deposits, all having to be washed and screened.

GUARD RAIL

Rustic guard rail is being used throughout on the highway, the dimensions being: posts, 6 feet long, with 12-inch minimum and 18-inch maximum diameter; rails, 16 feet long, with 9-inch minimum and 12-inch maximum diameter, measurements with lap splice joints. The material for this rail is being secured locally of native fir, most of which was gotten out, cut in lengths, and peeled during the Winter of 1926-27. Posts are to go 3 feet 10 inches in the ground, the lower 4 feet 4 inches to be treated with carbolineum, the balance of post and rail to be stained light brown with creosote stain. Very little guard rail has been placed to date.

SURFACING

Surfacing operations were started last Fall on Project 227, Section "B", a double unit crushing plant being installed with a gyratory to act as a breaker, and a Simons disc to take the return. Material from a gravel pit was brought to the crushers with a drag-line bucket, and Mack trucks with 5-yard dump-bodies were used for hauling units. About 5 miles of surfacing were placed when operations closed down in November.

Lyons and Price, contractors, of Spokane, Wash., have a sub-contract for surfacing the entire job. They expect to put another crushing plant on the lower end of the work as soon as possible this Spring.

QUANTITIES

The approximate final quantities on Projects 226 and 227 will be as follows:

Quantity	Unit	Description	Unit Price
161,000	Cu. Yds.	Common Excavation	$0.32
408,000	" "	Intermediate Excavation	0.48
140,000	" "	Solid Rock Excavation	0.95
337,000	Sta. Yds.	Overhaul on Excavation	0.03
51,900	Cu. Yds.	Top Course Surfacing	1.45
51,900	" "	Base Course Surfacing	1.45
33,000	Mi. Yds.	Overhaul on Surfacing	0.20
6,075	Lin. Ft.	15" Concrete Pipe	2.10
2,154	" "	21" " "	3.12
1,245	" "	27" " "	4.14
162	" "	30" " "	6.45
270	Cu. Yds.	Class "B" Concrete	28.00
388	" "	Class "A" Concrete	29.00
23,710	Lbs.	Reinforcing Steel	0.08
24,585	Lin. Ft.	Rustic Guard Rail	0.90
100	Cu. Yds.	Hand Placed Riprap	2.00
221	Acres	Clearing	130.00
122	Acres	Grubbing	160.00
36.9	Miles	Finishing	90.00

In the above estimate of excavation quantities, it is assumed that these amounts will cover all slides, but because of the fall of heavy snow on unfrozen ground late last Fall, it may develop that this will cause more slides in the Spring than were visible when the work closed down in November. However, the work will all be remeasured for final quantities when the job is completed.

It was contemplated that this work would be completed November 1, 1927, but because of the fact that the contractor failed to put on enough force and equipment in 1926, and to the unusually wet season in 1927, it will take all of the 1928 season to complete it.

Roller Takes the Kinks Out of the Boom

THE ingenuity of construction superintendents in contracting organizations knows no limit. Let anyone visit a dozen or two different highway contracts under way and he will be impressed with the ease with which the superintendent overcomes obstacles through the use of mechanical ingenuity.

Not long ago it was necessary to move a concrete mixer in somewhat of a hurry from one end of a contract to the other. The mixer had been idle for a few days and the boom had been swung to the extreme right to get it out of the way. The operator started up the engine and began to move the mixer. Before he realized it the boom was endeavoring to wrap itself around a telegraph pole just off the grade. To remove the boom and send it to a foundry to be straightened would have meant a serious delay to the contractor, as aggregate and cement were ready at the other end of the project for immediate use.

The superintendent, although rather put out with the carelessness of the operator, straightened the boom in a few hours by simply laying it out on the subgrade and running a 10-ton roller over it. This did a remarkably good job and it is doubtful if a trip to a local foundry could have produced better results.

Roughing Out a Golf Course in Two Days Was the Job of This Caterpillar Twenty with the 1½-Yard Self-Loading Scraper

A New Book on Highway Materials

A TEXT book covering the production, specifications, sampling and testing of highway materials has recently been completed by Edward E. Bauer, Instructor in Civil Engineering, University of Illinois. This book, while primarily intended as a college textbook, will be of interest to engineers in preparing specifications and to contractors in checking up on them.

The book is divided into four parts, the first of which contains a brief account of the production of each highway material; the second a discussion of the qualities of materials desired for each type of pavement and typical specifications. The third part treats of the sampling of highway materials, including the standard methods of the American Society for Testing Materials. The fourth and concluding part is devoted to the testing of highway materials. The book is profusely illustrated, contains numerous tables and is clearly written. The publishers are the McGraw-Hill Book Co., Inc., New York

Panorama of the Lafayette Rolled Earth Filled Dam Taken from the Central Mixing Plant

Equipment Used in Building an Earth Dam

By Charles W. Geiger

THE Lafayette rolled earth filled dam which is now approximately 50 per cent completed is one of the major projects of the Mokelumne River Water Supply Project for the East Bay Municipal Utility District of California. The dam is located a short distance west of Lafayette, near the Tunnel Road, and will completely fill the space between two hills a short distance south of the Tunnel Road where there formerly existed a valley filled with oaks. The great structure will be one of the largest rolled earth filled dams in the world, if not the largest. It will be approximately 900 feet thick at the base, 170 feet high and narrowing to a 20-foot roadway at the top. It will contain approximately 2,000,000 cubic yards of material.

The Lafayette Reservoir will have a capacity of 12,000 acre feet and will serve three purposes on the Mokelumne River Water Supply Project: equalization, emergency storage and a by-pass into Upper San Leandro Reservoir. The Lafayette pumping plant, which is located near the reservoir will lift the water from the Walnut Creek— Lafayette concrete aqueduct into Lafayette Reservoir. The building only has been completed, the pumps not yet having been designed, there being no immediate necessity for them as they cannot be used until the Lafayette Dam is completed.

A system of electric lights, supported overhead and lights mounted on the power shovels which are all electrically-operated, permits work to be carried out efficiently at night, two shifts of eight hours each being operated at present.

Central Mixing Plant

A central mixing plant equipped with a 1-yard Lakewood concrete mixer supplied all concrete for the dam, such as core wall, spillway, outlet tower, and for paving the upstream face of the dam. This mixing plant was located on the hillside. Aggregates were hauled from the railroad siding 1½ miles distant by four Fageol 4-yard trucks. The aggregates are unloaded from the drop-bottom railroad cars into a hopper under the railroad tracks and conveyed to the motor trucks by a Russell portable loader driven by a LeRoi engine. An 8-yard truck can be loaded in five minutes by this arrangement.

The concrete from the concrete mixer is delivered directly into Iron Mules which carry 1-yard loads and are able to reach any point where concrete is to be used. These consist of special bodies mounted on Fordson tractors. The upstream face of the dam is being paved with 6-inch reinforced concrete pavement laid on 9

A Portable Russell Loader Used in Loading Crushed Rock and Sand into the Motor Trucks

Overhead Sprinkler System for Embankment Shown Above with Hose Attached. Adams Grader Hauled by Caterpillar Tractor Handling Material in Foreground

inches of gravel. The Iron Mule with its load of concrete is run out on a portable ramp and the body dumped, the concrete passing through a chute to the point where it is to be used. In pouring the concrete for the outlet and inlet pipes, a similar method was used. Another ramp is being used in delivering the concrete used in the construction of the concrete outlet tower which will rise to a height of 145 feet with an inside diameter of 8 feet. Outlet valves are located every 20 feet in the outlet tower, which permit water to flow into the tower and out through the concrete outlet pipe to the main aqueduct.

EARTH-HANDLING

The 2,000,000 cubic yards of material with which the Lafayette dam is being constructed are handled by four Marion electrically-operated shovels, a fleet of motor trucks, six Caterpillar tractors, two Russell graders, a 15-ton power roller, Rohl petrolithic tampers, a Western railroad-type plow, a McMillan hydraulically-controlled bulldozer, a P & H crane, a Northwest crane and an Austin loader, a P & H Model 700 1¼-yard gas shovel and a P & H ¾-yard excavator.

The Marion shovels are working in borrow pits near the dam, and load the material into dump-bottom motor trucks equipped with Wood-Detroit hydraulic hoists, and specially built 9-yard Wood-Detroit bodies. These bodies are used on the trucks which are transporting the material for the porous section of the dam of which there will be 800,000 cubic yards. The material is dumped on the embankment and then spread by Caterpillar-driven Russell graders and the McMillan bulldozer in layers approximately 8 inches deep after which four Rohl petrolithic rollers are hauled over the fill until it is thoroughly compacted. This operation is repeated with successive layers. These tampers consist of four rollers equipped with special ball-shaped feet which are much more effective in compacting the embankment than a plain roller. Four of these rollers, compacting a path 11 feet in width, are towed by a Caterpillar tractor an average speed of 3.5 miles an hour.

An interesting feature of the project is the overhead sprinkling system. A series of 2-inch pipe lines is suspended overhead and connected to a 50,000-gallon water tank located on the hillside. At various intervals hose lines are attached and used for sprinkling the embankment and for supplying water to a special sprinkler truck which is also used to wet down the embankment.

Material Handling on the Lafayette Dam Showing the 8-Yard Trucks Equipped with Wood-Detroit Bodies Dumping Material on the Embankment and Adams Grader with Caterpillar Tractor Leveling the Material

The Loaded Iron Mule Was Run Out on This Portable Ramp and the Concrete Dumped Directly into the Chute for the Up-Stream Mat of the Lafayette Dam

More Standardization Needed

ED HOFFLICH is a spare individual in the early fifties, has a drawl and only two teeth in the front of his upper jaw. He was hired to drive a team and handle a bottom-dump wagon on a grading job in western Pennsylvania. All went well for a few days when he drew up near the foreman and called out, "This wagon squeaks too bad, she needs grease and a lot of it." "Well," said the foreman, "the grease can is back at the other end of the job. Better hitch on to this other wagon for the rest of the day and leave yours to be greased tomorrow."

The shift was made and off went Ed for another load. When he returned the foreman gave the signal for him to dump the load. Ed stepped on the pedal that was in front of him as he had been accustomed to, but the load did not dump. The foreman yelled, Ed stepped harder but no dump. The foreman stopped him, examined the wagon and said, "There's a dog here that you should have thrown over before trying to dump with that pedal." Ed grinned and drawled, "Guess she wa'n't standard gear shift."

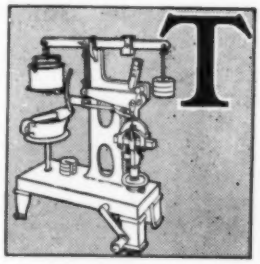
McKibben Lists Welded Structures

A TOTAL of 85 welded structures, including 43 welded buildings, is listed by Professor Frank P. McKibben in the July issue of the General Electric Review. The list is made up of 8 bridges, 43 buildings, 3 cars, 2 cranes, 6 frames and towers, 12 ships and allied structures, and 11 tanks.

Contractor Has Own Concrete Testing Laboratory

By F. E. Spurney

Assistant Superintendent, Turner Construction Co.



TO aid in the work of controlling the quality of concrete for strength and uniformity, the Turner Construction Co., Graybar Building, 420 Lexington Avenue, New York, created a Concrete Testing Department, and a Concrete Laboratory was established early in 1927 at the Turner Shop, Maspeth, Long Island, N. Y. The first work undertaken was that of educating the field men of the Construction Department in the theories and methods of concrete control. To start the educational work the Portland Cement Association and the Turner Testing Department co-operated in giving a laboratory course on design and control of concrete mixtures to all field men in the New York district. The course was given at the Cooper Union Materials Laboratory.

Then this was extended to the men on jobs located in branch office districts by visiting their jobs and performing the work of design and control right on the jobs with their assistance and for their direct benefit.

For testing standard 6- x 12-inch and 8- x 16-inch concrete cylinders a 200,000-pound Olsen hydraulic compression testing machine was installed at the shop at Maspeth. The laboratory was also equipped with steel cylindrical molds, machined steel base and cover plates, test sieves for grading aggregates, slump test cones, scales, graduates, unit weight measuring cans, thermometers and other items necessary for the efficient performance of the work.

The operation of the laboratory is carried on in two parts: first, the design of concrete mixtures at the jobs; and second, control of the concrete as the jobs progress by means of strength tests.

About two weeks before concrete operations are scheduled to start on a job, the laboratory sends out a complete set of testing equipment. This includes a complete slump test outfit, a standard 1/5-cubic foot steel measuring can, four steel 6- x 12-inch cylindrical molds, eight machined plates, a complete set of standard Tyler test sieves and a 40-pound capacity dial scale. The field men use this special equipment to design the best possible concrete mix that can be obtained from

The Concrete Testing Laboratory at the Turner Shop, Maspeth, Long Island, N. Y.

the materials supplied to the job. The testing department then checks the design and mixes an experimental batch of concrete using the design proportions. Test cylinders are molded from this experimental batch and the 7-day strength results are available before any concrete work has started on the contract.

As soon as the best proportions are determined the measuring hoppers at the mixer are calibrated and the amount of water to be used in each batch is set off on the water-measuring tank. This is a cylindrical steel tank calibrated in gallons with an overflow pipe attached to the side of the tank near the bottom by means of a swivel elbow. The overflow pipe can be set and locked in any desired position to insure the correct amount of water going into each batch. These new water-measuring tanks are now included as standard items of plant equipment and are shipped to every job requisitioning a mixer. The hoist buckets into which the concrete is dumped from the mixers are also calibrated in order to facilitate measurement of the quantity of concrete produced by each batch.

The work is carried on until the job is completed. A set of four test cylinders is made from concrete sampled as it goes into the forms and represents each 200 cubic yards of concrete in the structure. The cylinders are stripped from the molds on the second day, and if the job is near New York, are shipped to the laboratory for storage and curing in damp sand. Two cylinders of each set are tested at 7 days and two at 28 days. The tests are reported to the jobs and plotted on curve sheets at the offices of the executives in charge with the result that the quality of the concrete going into each structure is followed very carefully. On jobs outside of the New York district, the cylinders are tested at the nearest municipal, state or university laboratory, and the results sent to Maspeth for study and plotting.

On very large out-of-town contracts it is sometimes desirable to operate a concrete testing laboratory in connection with the job. One such laboratory is in full operation on the James River Bridge, at Newport News, Va., in charge of M. A. Timlin. A 200,000-pound Olsen hydraulic compression testing machine is used for crushing the cylinders, and special care is being taken with the mixing and placing of the concrete, inasmuch as the various structures going to make up the bridge will be exposed to sea water and salt air.

Reprinted from the *Turner Constructor*.

NEW ADDITION TO THE DANTE SANATORIUM, SAN FRANCISCO, CALIF.

This outstanding sanatorium of the Pacific Coast is a 5-story, reinforced concrete structure. It is being built by S. Rosori, who has an enviable reputation for concrete work. A 1:2:4 concrete mixed in a Davis 14-S mixer is buggied from the hoisting buckets and hoppers made by Norris K. Davis, of San Francisco, in Sterling concrete carts

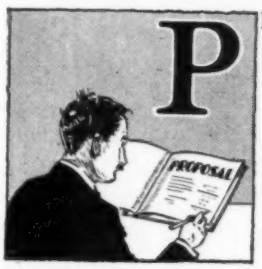
New Plastering, Bricklaying, and Tile-Setting Manual

A COMPLETELY revised new edition of the Marsh-Capron handbook for plastering, bricklaying, and tile-setting, containing the latest formulas and working tables has been issued by the Marsh-Capron Co., 115 S. La Salle Street, Chicago, Ill. Details of methods and shortcuts for saving time, labor, and material form a part of this edition, which is well illustrated with photographs and drawings of actual operation. One of the most convenient features of the handbook is a table for figuring room yardage. Copies of the manual may be obtained from the company, or from its representatives in various cities, who will be glad to send it on request.

Suggestions on the Preparation of Proposals

By D. H. Dickinson

Morse & Dickinson, Consulting Engineers, Boston, Mass.
Engineering Counsel for the New England Road Builders Association



PREPARATION of a bid should be a somewhat deliberate proceedure, and ample time should be allowed so that all the essential facts connected with the project may be ascertained. In the typical state highway job, the prospective bidder is supplied with the usual form of specifications and contract, together with a sheet containing more or less useful, but generally incomplete, information relative to the work, and he is allowed to examine the plan, profile and sections on file at the office of the state department. To my knowledge, no arrangement has ever been made for supplying bidders with copies of the plans for their individual use.

There is a great advantage in securing a complete set of drawings when taking out the specifications. They will prove of great assistance if studied in the field in connection with the proposed work, as it will generally be found that a much clearer idea of the details involved may be had in this manner than would otherwise be possible. They would also be available later for construction use in the case of the successful bidder. Before submitting his bid it is advisable for the bidder to ascertain on what date the survey was made. In certain soils, levels taken during the winter months may affect the quantities unfavorably. By actual measurements I have found a variance as great as 6 inches between summer and winter levels taken over the same roadbed. While this difference may be considered a maximum, and even somewhat unusual, it is, nevertheless, the part of wisdom to take the precaution which I have mentioned.

Furthermore, I recall instances where several years have elapsed between the time that the original cross sections were taken and construction began, and in such cases it is always well when examining the road to determine if possible whether the surface has been graveled in the meantime by the local authorities. This may prove useful information later for the low bidder.

Specific Points to Scrutinize

The specifications should be studied with exceeding care, for those in general use form such a complex document with their usual scattered addenda that it is easy to be mistaken sometimes in regard to their exact meaning. Special attention should be given to such features as provisions for handling traffic, whether the road is to be built in half section, and time limit. The personality of the engineer may also receive some justifiable weight. The bidder should thoroughly understand the provisions of the drawings as well as those of the specifications and if any doubt exists, it should be dispelled before his signature is affixed.

The plan usually carries but little information of value to the bidder unless an extensive change of alignment is involved. Far more information can be secured from the profile and cross sections, particularly the latter. For several years it has been the custom of departments to furnish the bidder with an information sheet for each job. This is helpful to a certain extent, but should never be taken at its face value. It is invariably hastily prepared and should be used mainly for the purpose of stimulating individual investigation.

In preparing a bid the element of cost is always of prime consideration. The main reason why road contracting, one of the biggest industries in the country, is not more prosperous is because some of the contractors do not know what their work actually costs item by item, and until costs are known we will continue to have this unhealthy bidding situation based on the guess formula, unsatisfactory to the public, and doubly so to the contractor. The man who bids below cost not only works for nothing and pays for the privilege, but often deprives another of the opportunity to make a fair profit.

D. H. Dickinson.

The Unbalanced Bid

The unbalanced bid should, of course be guarded against. The bidder who takes a chance that a certain item may be materially reduced, or may be eliminated from the contract altogether, and therefore, bids an unreasonably low price, can certainly be considered as having submitted an unbalanced bid, and has only himself to blame if he loses. On a project that may show a large volume of surplus excavation and where the enterprising bidder finds that he can dispose of the excavation at a profit, he is justified in cutting his price if he so desires, and in so doing he should not be accused of submitting an unbalanced bid.

There is always the prospect of an alteration in design after the work is in progress where the specifications contain this provision, and the prices bid should be such as to carry a reasonable margin of profit in case there should be a considerable increase in any of the various items.

In answer to the question "How can a man bid low enough to be in the running, and at the same time be assured a reasonable profit?", this can only be accomplished through the agency of intelligent, and careful bidding by all concerned.

Costs

On every job there are a few major items like excavation, borrow and broken stone, where cost data could be kept by the timekeeper at no great inconvenience, or expense. The main trouble with our bidding is that in our haste we often neglect to include various expenses for which ample provision should be made. First ascertain as near as possible the actual cost of the various items and then apply the following fixed charges: premium on bond, liability insurance, workmen's compensation, depreciation on equipment, interest on investment, overhead charges, and profit. In overhead charges, the contractor's time, his personal transportation, office expenses, clerical force, legal assistance, taxes, penalties under the contract, uncollectable accounts, interest on borrowed money, and any other items that come up, should be included.

Most contracts provide for monthly payments to the contractor based on 85 per cent of the amount of work performed, but the engineer often plays safe at the contractor's expense, and instead of a 15 per cent reserve it is usually much more. This increases with the progress of the job as additional items are included in the estimate, and as delays in making payments for extra work occur. It frequently happens that as much as 25 per cent of the cost of the job is withheld at the date of completion, and unless a portion is released by the bond company at that time, it continues to be retained until the expiration of the retention period. Interest on the equivalent in borrowed money may amount to quite a sum. It may or may not be common knowledge that in cases of this kind the Public is receiving interest on the contractor's money plus the use of a product which the contractor continues to finance.

ACKNOWLEDGMENT: From a paper presented before the members of the New England Road Builders Association, March 28, 1928.

Long Welded Water Supply Line for Springfield, Mass.

WHAT is believed to be the longest welded pipe line in the East is now being built to supply water to the city of Springfield, Mass. This main, which is a part of the Little River Project, will carry water from the Provin Mountain Reservoir, a distance of seven miles to the city proper, dropping more than 300 feet in elevation and passing under the Connecticut River on the way.

The new pipe line is being installed by Daniel O'Connell's Sons, contractors of Holyoke, Mass., and Walsh's Holyoke Steam Boiler Co. of the same city is making the welded pipe, using General Electric welding equipment and electrodes.

A Cletrac 40 Hauling a 30-Foot 48-Inch Diameter Arc Welded Pipe Along the Springfield, Mass., Water Pipe Line

Multiple Arc Welding Machine for Automatically Arc Welding Pipe for Springfield, Mass., Water Works

The pipe line will probably be completed in the Fall of 1928.

From the Provin Mountain Reservoir to the west bank of the Connecticut River a single line of 54-inch and 48-inch diameter pipe is used. Two lines of 36-inch diameter each are laid under the Connecticut River and, from its east bank, a single line of 48-inch and 42-inch pipe connects with the present distribution system of Springfield. The plate used in the pipe varies in thickness from 5/16- to ½-inch.

The pipe is made in 30-foot lengths from two 30-foot plates which are bent into half cylinders and automatically arc-welded together. To facilitate joining sections in the field the plates are so sheared that the pipe diameter increases slightly from one end to the other, thereby permitting the small end of one section to fit into the large end of the next section.

The machine, which automatically welds the pipe, consists essentially of three horizontal beams, two above the joint and one below. By the use of compressed air, the plates are held rigidly in position during the automatic welding process. Welding is accomplished by means of the multiple-arc process, employing two arcs, one following about eight inches behind the other. Two automatic welding heads, used to feed the wire, are mounted on a single motor-driven adjustable-speed travel carriage, which moves the heads along the work at the proper welding speed. By using two travel carriages with a total of four arcs working simultaneously, a 50 per cent saving in welding time per pipe is effected over that necessary with one travel carriage and two arcs.

Each pipe section, after welding, is subjected to careful tests.

Better Joints for Asphalt Paving

ACCORDING to a report from the Asphalt Association, an asphalt raker at Cleveland, Ohio, has developed a procedure for obtaining a satisfactory joint in asphalt paving made necessary due to a stopping of the work on account of delay or for over night. Frequently, cracks, even if they do not extend across the joint start from the joint. The causes of cracks are varied, such as merely painting and overlapping of joints, other than sheet asphalt. The main causes, however, are in the raking and tamping.

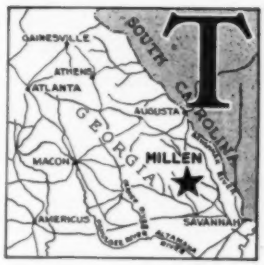
A raker should pack the joint with his rake and comb it thoroughly. Then the tamper should tamp it soundly to compact it and seal the joint with the tamper. Then the hot smoother grafts or welds the hot or cold material into a continuous sheet.

In most cases, however, a raker combs the mixture on the top, leaving the material next to the base just as it was shoveled. This raking makes the top look all right but the trouble is underneath and is not noticed until cracks appear. If both the raking and tamping are done thoroughly, the major source of cracks in asphalt pavements will be eliminated.

Building a Pile Trestle Bridge Across a Swamp

By Fred M. Garnett

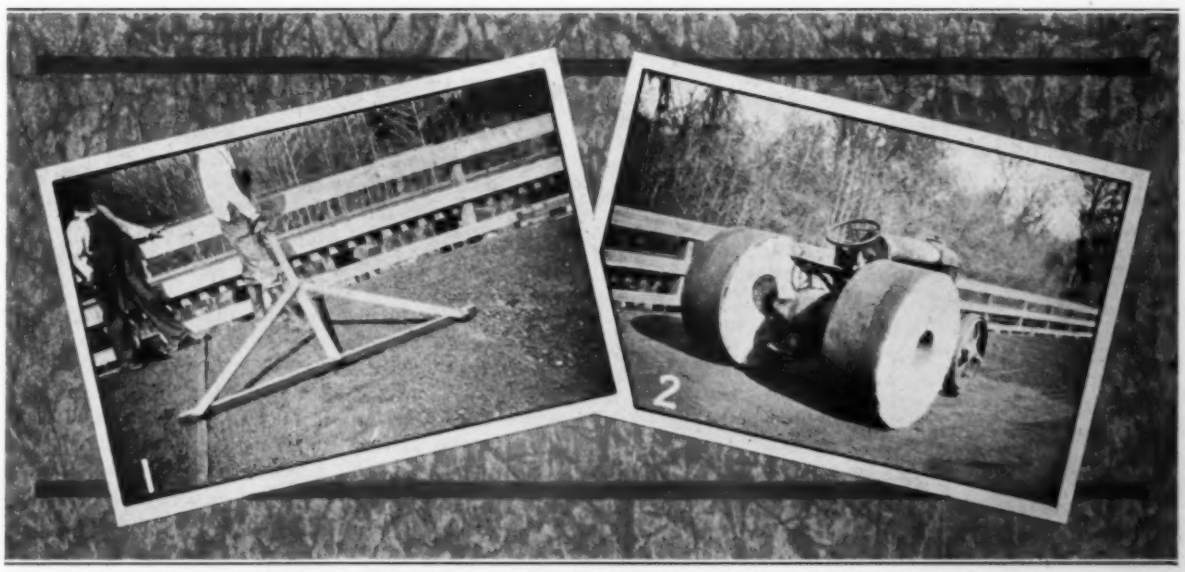
Division Office Engineer, State Highway Department of Georgia



TWO miles from Millen, Ga., on State Route No. 67, the Millen - Statesboro Highway crosses the Ogeechee River and swamp over a newly constructed causeway and bridge, and in addition to shortening the distance, eliminates two grade crossings over the Georgia & Florida Railway. A few years ago the state highway department constructed a bridge 1,210 feet in length across the river, and relocated and built a suitable causeway on the east side of the crossing. There still remained the problem of locating and constructing an approach on the west side of the crossing. For a good many years Jenkins County was forced to maintain a narrow causeway together with a series of small lagoon bridges. During freshets the river would overflow its bank and cover the causeway, making traffic very uncertain and difficult, as well as dangerous. Due to lack of funds the country could not make any substantial improvements until assisted by the state highway department with State Aid funds. The completion of this crossing is of particular interest inasmuch as hazards to traffic at two grade crossings have been relegated to the past. In contrast to the series of small lagoon bridges to the old approach, is the completion of one large bridge, 1,280 feet in length, which serves as a relief opening through the swamp.

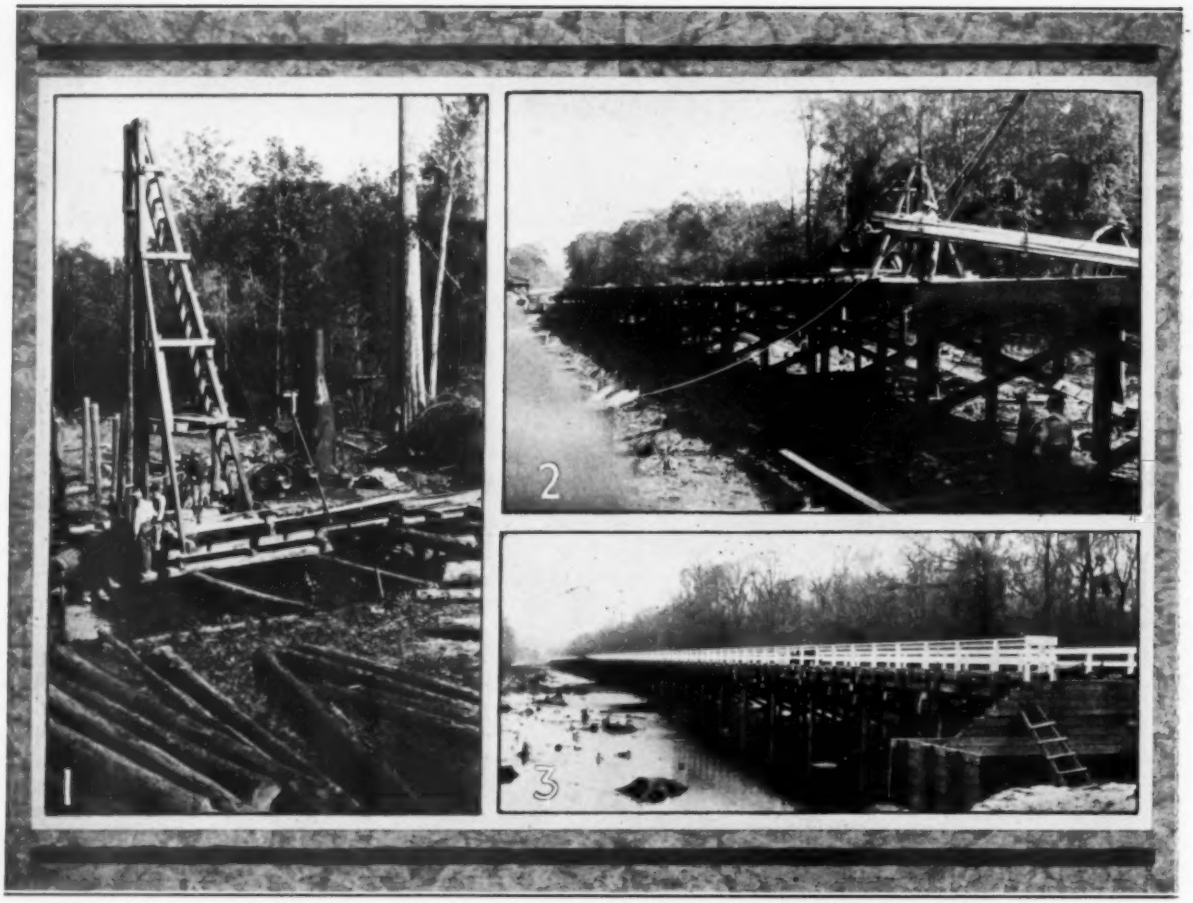
Grading Work by Dragline

This project was constructed under two different contracts. The grading work was done by Jenkins County with its force. Work was begun on the grading contract in August, 1926, and completed in January, 1928, at a cost of $34,433. The project parallels the Georgia & Florida Railway through the swamp for the major portion of its length, then curves and leaves the swamp and connects up with the old highway. A dragline was used for the heavy grading work through the swamp. Material was excavated from berm ditches along the right-of-way, and from conveniently-located borrow pits. Use of the dragline eliminated the necessity of hauling material for embankment from borrow pits located a considerable distance from the project. The advantage of placing the dragline in the swamp was reflected in the tremendous saving in overhaul and expedited the progress of the work. An embankment, 30 feet in width between shoulders, was constructed with a slope of 1½:1, the average height of which was 10 feet above the swamp level. Grass was planted liberally over the shoulders and slopes to protect the embankment from washing. A temporary surfacing of sand clay was placed over the sub-grade for the full width of 30 feet. This surfacing is 9 inches thick, compacted in the center, and should serve traffic until the embankment has settled sufficiently to place a more permanent type of surfacing. Woven fabric guard rail along the embankment serves to protect traffic, and imparts a finishing touch to the project.



LAYING BRIDGE FLOOR ON PILE TRESTLE BRIDGE IN JENKINS COUNTY, GA.

1. *Placing Kyrock bridge mat with template and lute.* 2. *Roller improvised from a Fordson tractor at an approximate cost of $25 for rolling the Kyrock bridge mat*



CONSTRUCTION OF THE PILE TRESTLE BRIDGE IN JENKINS COUNTY, GA.

1. The special pile driving rig for driving from the ground. The rig was movable, longitudinally and transversely with the roadway. 2. The special rig for hoisting and placing heavy timbers in the deck. 3. The 1,280-foot cypress timber bridge near Ogeechee River, showing the special design of bulkhead for sustaining the pressure of the embankment. The sway bracing of the bents is also shown

CONSTRUCTION OF BRIDGE

The contract for the construction of the 1,280-foot bridge was awarded to Mallory & Nash, Atlanta, Ga. Work was begun on this contract in August, 1926, and was completed in March, 1927. The bridge constructed is of the pile trestle type, with four piles to the bent, comprising sixty-four 20-foot panels of 85 per cent heart cypress timber. This bridge was designed for the loading of one 10-ton typical truck, with no allowance for impact, and each pile computed to have a bearing capacity of at least 12 tons as determined by the Engineering-News formula. Particular attention was given to the sizing and painting of hand-rails and posts, which greatly added to the appearance of the bridge. Two coats of white lead in oil were applied to the hand-rails and posts.

An interesting feature in the construction of this bridge was that it parallels the Georgia & Florida Railway Trestle. The bents were constructed in 20-foot panels; whereas, the bents in the railway trestle were spaced 10 feet; this made every other bent in the bridge coincide with the bents in the trestle, and insured a maximum opening for the passage of water. In addition to the construction of the cypress timber bridge, there were three large concrete box culverts constructed. The total cost of the work done under this contract was $38,265.73. The entire cost of the project was $72,698.73 of which the county's share was twenty-five per cent, and the state's share seventy-five per cent.

PILING DRIVEN FROM GROUND BY SPECIAL RIG

A pile-driving rig was improvised for driving piling from the ground, since local conditions permitted work to be handled in this manner. The pile driver used comprised the use of a double-drum steam hoist and 2,000-pound drop hammer. The contractor used a 6¼ x 8-inch Flory double cylinder, double drum steamhoist. The hammer, fittings and all other parts were made from the contractor's own designs. The pile-driving rig was movable longitudinally and transversely with the roadway. A cradle on 8-inch pipe rollers carried the driver from bent to bent outside of the line of piling. The rig was shifted from pile to pile in driving each bent by the use of 6- x 6-inch guide timbers sliding in two 6-inch channel irons bolted to the cradle. No difficulty whatever was experienced in driving piling by this method. Moreover, the work was very economically done.

HANDLING AND PLACING TIMBERS

The rig employed for handling and placing timbers

was a 1-ton A-frame derrick on three 4-inch pipe rollers, with a 24-foot boom, using a Fordson tractor with 12- x 16-inch drum made of standard pipe for hoisting. One rear wheel of the tractor was removed and a drum put on the rear axle. The hub of a rear wheel was fitted in the drum. The tractor was mounted on the derrick frame. A hand crab was bolted to the A-frame for raising and lowering the boom. Considering the size and weight of the timbers the work was economically performed by this rig. A small air compressor driven by a Fordson tractor was used for boring holes and driving part of the nails. Sullivan Little David boring machines were used for boring holes, and a jack hammer was used for driving nails. The boring of holes in this manner was most economical. The cost of driving nails was about the same as hand driving.

PLACING THE KYROCK BRIDGE MAT

A 10-foot templet was used for placing the Kyrock bridge mat to insure a uniform thickness, and any inequalities which showed up were worked out with a hand-operated lute of simple construction before rolling was begun. A Fordson tractor was converted into a roller especially for rolling the bridge mat. This tractor was equipped with two concrete rear wheels. The cost of converting the tractor into a road roller was approximately $25. Aside from being economical it was well adapted to this purpose and gave gratifying results.

FORCE AND EQUIPMENT USED

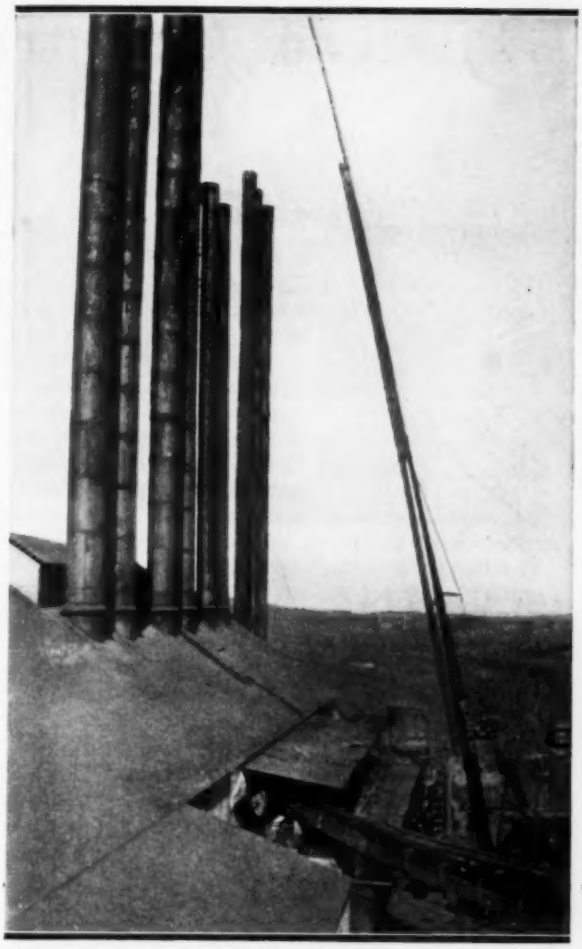
There was an average working force of 2 skilled laborers and 10 unskilled laborers employed on the bridge contract. The contractors used two 3,000-pound Fordson tractors, one 1-ton Ford truck, and one 1-bag Jaeger concrete mixer. The Ford truck and concrete mixer were used in the construction of the large concrete box culverts and were not used on the timber bridge work. The average daily operating expenses of the contractors were $40, which is very low, considering the satisfactory manner in which the work was prosecuted.

119-Foot Boom on Truck Crane

WHAT is believed to be the longest boom ever used on a truck crane was one used recently on a Universal crane for removing the top section of a smoke stack that had burned through and hung unsupported, threatening to drop and crash through the smelter roof.

This 10-foot section of a 110-foot smoke stack of the Leyden Coal Co. of Denver, Colo., was too weak to support a man on a gatling. A scaffold was suggested as a means of removing the section but because of the expense of materials of the scaffold the erection of gin poles was considered. But the expense of erecting two necessary 110-foot gin poles and transporting them to the job, a distance of 20 miles from Denver, was prohibitive. Then a Universal crane owned by the Weicker Transfer & Storage Co. was suggested by A. E. Gallagher, Superintendent of the latter company.

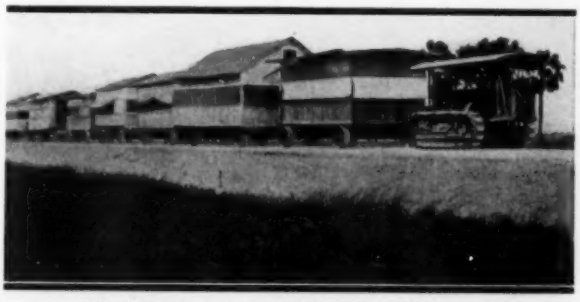
Mr. Gallagher started equipping the crane with a 119-foot boom by, first, lashing a 65-foot timber telephone pole along under the side of the standard 44-foot steel boom on the crane, allowing 35 feet to extend beyond the boom head. Next, a 75-foot timber was placed with the butt end resting against the standard boom head and was securely lashed along the top of the first 35-foot timber extension. The boom hoist guys were fastened about 30 feet back of the boom head and the boom



Assembly of the Two Timber Extensions on the Universal Crane Boom Used in Removing a Section of Damaged Stack

was raised into working position at which point the boom head was 124 feet above the ground.

Next, it was necessary to cut the damaged section loose and this was accomplished by sending one of the men, Joe Baty, up in a boatswain's seat which was raised and lowered by a line fastened over the boom head and operated on the crane winches. While he was in the air, as a further precaution, the long boom was guyed by several additional ropes. Baty cut the damaged section loose, fastening it to the hoisting line on which it was slowly lowered to the ground.



MOVING DAY ON THE TAMIAMI TRAIL

Caterpillar Sixty Owned by Alexander, Ramsey & Kerr, Inc., hauling the Mobile camp equipment to a new site as work progressed. Photograph by McDonald & Burgman, distributors, Jacksonville, Fla.

Modern Construction Tools for the Philippines

By H. F. Wilkins

THE big job of the man who seeks to market modern American tools and equipment in the Oriental engineering field is to overcome a tremendous inertia against innovation, an heritage of centuries of cheap man-labor which fears starvation and unemployment when machinery takes its place. In that sense, the task is the same as that which faced pioneering with power machinery in America a generation ago.

The Philippine Islands, after more than a quarter of a century of United States ownership, still are only on the verge of seeing the advantage of modern tools in public works. But industrially and economically, the country is considered ripe for practical large-scale demonstration of the advantage of power machinery on large projects.

They recently had such a demonstration. A 30-day test was staged by Caterpillar tractor agents and the Pacific Commercial Co. of Manila, with a fleet of modern excavating machinery, and attracted favorable attention in high places. It is regarded locally as a significant step in showing Filipino contractors and engineers that in spite of available labor at 45 cents a day, power machinery can move earth cheaper, quicker, and with greater profit in the long run.

The Contract

The demonstration was staged under an unusual contract, backed by the Public Works Department of the Philippines and signed by the demonstrators and the governor of a province who is also a large-scale contractor.

A. D. Williams, Director of Public Works, and Governor Satero Baluyot of Pampanga Province, One of the Richest Contractors in the Islands

The work was done on a big irrigation job—the Penaranda Irrigation Project in Nueva Ecija Province. The canal excavation should have been completed two years ago, according to the original agreement between the Public Works Department and the contractor. But after three years of work, the contractor was about to ask for another extension, with the excavation only 30 per cent complete.

The excavation machinery agents saw the situation and made a proposition whereby they were to bring a fleet of tractors, scrapers, wagons and rippers to the scene, work on an untouched section of the main canal, and excavate at a cost considerably cheaper than the

"THE BIG PARADE"

In line are shown, from left to right, a Killefer Scraper, Killefer bulldog ripper, three Baker-Maney scrapers, a Caterpillar Thirty, a Russell elevating grader, two Athey wagons, another Caterpillar Thirty, a Russell Super-Mogul scraper and a Caterpillar Sixty

contractor could get the work done under the "pukiao" system, the Philippine method of doing business.

The contract specified that "if after the demonstration, it is proved that the equipment can perform excavation work at a cost not exceeding 16 centavos per cubic meter for direct casting by elevating graders in soft ground and 70 centavos for elevating graders loading to wagons in hard ground," then the contract is binding, and Governor Satero Baluyot of Pampanga Province, the contractor, was to buy most of the machinery used in the demonstration at an agreed purchase price of $25,000.

If the test was not completed as per contract, the contractor was not required to buy the machinery at all, and the demonstrators had to pay the costs of moving the equipment, all fuel and supplies, and only receive 40 centavos per cubic meter for earth excavated. The Philippine Government, according to the contract, was to make payments on the machinery and withhold the amount paid out from money due the contractor until the machines were all paid for.

THE PENARANDA PROJECT

The Penaranda Irrigation Project is one of the larg-

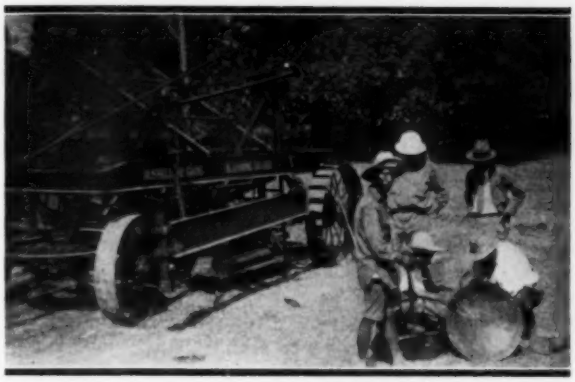
A Caterpillar Sixty and a Russell Grader Digging to Grade in the Main Canal on the Penaranda Irrigation Project

est in the Philippines. It consists of a big dam, headworks, sluiceway channels and earth dikes, and a complicated system of canals and diversion weirs. When complete, it will irrigate some 45,000 acres of rice and sugar land, increasing its productivity, according to calculations, about 450 per cent.

Things were at pretty much of a deadlock before this unusual contract. It was estimated that at the existing rate of progress, the main canal would not be finished for a number of years. In the meantime, interest on the bonded investment was mounting yearly, and it was costing the government about $150,000 a year in accumulated interest and loss of revenue from the project which would have been forthcoming from farmers whose land was benefited had the work been completed on time.

The main canal is to be about 5 miles long, with about 25 per cent of it in deep cut, 25 feet to 38 feet below the surface level and the rest approximately 10 feet deep. Some of the material to be excavated was hard gravel and clay and the rest soft clayey material that comes out in big soft chunks.

Under the prevailing "pukiao" system, which con-



The Russell "42 Giant" Grader in the Background Forms a Contrast from the Filipino Laborer in the Foreground Who Earns About 45 Cents a Day

sists of sub-letting the excavation work to small native gangs who complete a given portion of the work in a certain time at a set cost with pick, shovel, wheelbarrow, caraboo carts and the most primitive and back-breaking methods, the work was being done at an average cost of 90 centavos per cubic meter of excavated material. One man can move about a meter a day under the old method, and the average wage is 90 centavos per 10-hour day. That is 45 cents in American money. Wages actually range from 75 centavos a day to one peso and 20 centavos.

AMERICAN EQUIPMENT ON THE SCENE

W. P. Brooks, formerly with the Caterpillar Tractor Co., now with the Pacific Commercial Co., and J. J. Sabatier, Caterpillar representative in the Philippines, with Horace B. Pond of the Pacific Commercial Co., brought in the modern excavating fleet and supervised the job.

The equipment included one Caterpillar Sixty and two Caterpillar Thirtys, with the following auxiliaries: a Russell grader, 42-C, with 42-inch belt conveyor and rotary disc plow, with a 30-foot conveyor frame and belt for direct casting and a 15-foot conveyor frame for loading wagons at the bottom of the canal; a Reynolds rotary (Killefer) scraper; a No. 5 Killefer Bulldog ripper; three Baker-Maney, ¾-yard, elevating

Two Caterpillar Thirties with Baker-Maney Scrapers, Digging Out at the Foot of a Flume Where the Irrigation Flow Is to Be Harnessed for Power. The Drop Is 26 Feet Deep

wheeled scrapers; a Russell Super-Mogul blade scraper; two 7-yard Western wagons with Athey truss wheels.

The operators were all Filipinos who had never seen these machines before, and they had to be watched carefully. With this green help they excavated as much as 500 cubic meters a day in some places and completed 9,700 meters of finished grade, in the month's experiment. It would have taken months to do as much under the old "pukiao" system with barefoot labor.

They used three tractor drivers, two men on the graders and one on each of the dumping wagons, which worked in a section of deep cut for a period of 10 days.

The test was a complete success and the contract is held valid. The imported equipment accomplished the work at a cost less than the contract called for, and the machines are expected to be used in completing the rest of the canal excavation work. If they are so used, the project will be finished far sooner than by the older methods, and the government will be saved considerable money on the investment.

A Smooth-running Concrete Crew

THE concreting organization of Studebaker Sons, Brunswick, Ohio, is one that runs along with a minimum of troubles. Of course, every contracting organization has its minutes of heartache, its days when little things creep in to reduce the number of linear feet poured and its weeks when wet weather keeps everybody under cover, but when the average is determined it will be found that J. R. Studebaker runs his concrete crew with about as few loud words and gets as many feet of concrete between the forms as most men.

A fleet of Sterling and Autocar trucks maintains an almost constant supply of batches for the Koehring 21E paver. To prepare the subgrade for the concrete and minimize the overage of concrete, a Hug subgrade planer is used, pulled by the Cletrac 40 that has done fine work in the heavy hauling on rough grading.

A final subgrader is attached to the Koehring paver and is made most effective by two men assigned to watch the grade and remove any excess material or to fill where necessary. These two men, as soon as the subgrade is satisfactory, turn their attention to the spreading of the concrete, assisting the three men who give their complete attention to the spreading and spading. Two more men devote their time to the operation and shoveling in front of the Lakewood finisher.

Ahead of the mixer two men set the steel forms and align them. Behind the mixer and before the finisher has had a chance to complete his work three men set the interlocking curb forms and fill them from mortar boxes, one on either side of the road, into which the mixer has dumped a batch as required to keep them filled.

The job on which this organization was working in June was a concrete foundation for a brick road. The base was 5½ inches and the curb 3¼ inches. E. S. Leach was Inspector for the State.

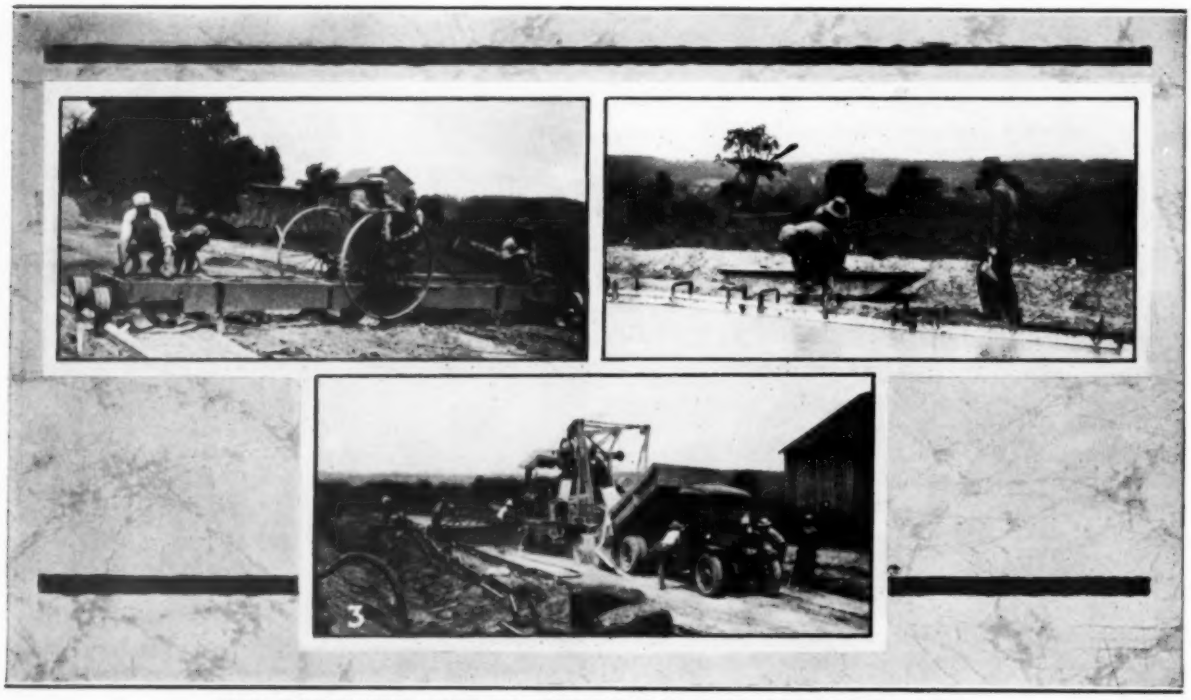
Guaranteeing Buildings

THE H. K. Ferguson Co., Cleveland, Ohio, international construction engineers, has announced the adoption of a policy of guaranteeing buildings for five years, instituting a new idea in building construction, according to Harold K. Ferguson, President of the company.

Beginning June 1, every lump sum contract undertaken by Ferguson engineers on plans and specifications which they have prepared or approved for guarantee includes this clause: "The builder guarantees the work against defective workmanship and material for a period of five years after date of completion."

Regular inspections at least once a year are included in the guarantee. Any defects found within the five-year period will be adjusted promptly by the Ferguson Co.

"We are able to make such a guarantee because we assume complete responsibility for layout and design as well as for the actual construction," Mr. Ferguson said.



THE EQUIPMENT USED BY STUDEBAKER SONS, BRUNSWICK, OHIO

Left, Hug subgrade planer. Right, setting curb forms and filling by hand from mortar boxes. Below, paving outfit, consisting of Sterling trucks and Autocars, a Koehring 21E paver, and a Lakewood finisher

Made Good *where other Pumps Fell Down*

A FAMILIAR experience with us. This time it was in Chicago—on the Illinois Bell Telephone construction job, shown in the above photograph. It was in a tunnel under the Chicago River, and the problem was to keep the tunnel dry during construction, under an

18 ft. Suction Lift

Pumps of other makes were tried; Couldn't handle that lift. The LaBour Portable Self-Priming Contractors Pump was put on the job after the others had failed, and it did—and is doing—the work to the satisfaction—even amazement—of the engineers in charge.

This handy portable Gasoline-engine-driven pump is "working miracles" wherever it is used. For instance, in the New York subways, it is meeting every condition of service, from pumping raw sewage to the removal of subterranean water through well-points.

LA BOUR Centrifugal Self-Priming Pumps—of various types and sizes—hold their prime, even when air is admitted at the suction. In fact, they

Actually Pump Air

to a vacuum! Extremely simple, they have no diaphragms or internal valves of any kind; no external priming attachments, and require no foot valves or priming tanks. The Impeller is the only moving part. A 20 ft. suction lift is guaranteed at, or near sea level.

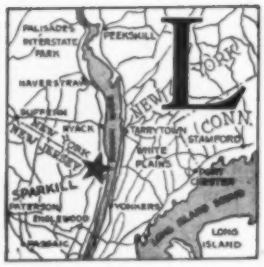
Built in various sizes and types, for stationary and portable service. Carried in stock by supply houses all over the country, or can be shipped immediately from factory.

Send for Bulletin 29-C

THE LaBOUR COMPANY, Chicago Heights, Illinois

Steel Viaduct Built During the Winter

Steel Structure of Sparkill Viaduct Project on Route 9-W Recently Completed Opens for Summer Traffic



LATE in 1927 the New York State Department of Public Works, Division of Highways, let the contract for the construction of the Sparkill Viaduct officially known as New Jersey State Line — Nyack, Part 2, State Highway No. 5714. The building of this causeway completes the construction of U. S. Route 9-W in Rockland County, N. Y.

The project begins on a promontory on the south side of the village of Sparkill at the north end of New York State Highway 8250 and is carried on an ascending grade of 0.5 per cent over the village streets and tracks of the Piermont Branch of the Erie Railroad to high ground on the north end of the village and there connects with New York State Highway 8136. The total length of the project is 2,200 feet of which 1261 feet is occupied by the steel structure, the remainder being used for approaches. The approaches are paved with reinforced concrete to a width of 30 feet.

Under the north approach an underpass has been constructed to provide safe ingress and egress for pupils and others from the district school situated near that end of the project. Where the underpass has been constructed it was necessary to build a widened curve to take care of the transition of the road built three years ago to the new approach to the viaduct. This section of widened curve was finished by hand and presents excellent riding qualities. To furnish a satisfactory transition plane from the old road which dips down at a steep grade south from the underpass, about 100 feet of the old road were torn out, the subgrade regraded, and a warped plane surface pavement laid.

The viaduct consists of longitudinal steel girders having alternate spans of 70 feet and 20 feet resting upon

Construction of the Sparkill Viaduct, Showing Steel Work About One-half Complete. In the Foreground Is Seen the Locomotive Crane Which Handled Steel from Railroad Cars to the Traveler on the Deck of the Viaduct

Waukesha-Engined Trench Hoe built by Universal Crane Co.

n-727-L

Waukesha Powered

Digging a ditch forty inches wide and ten feet deep thru shale with a half yard trench hoe is no easy job. Doing it day in and day out tests the stamina of engine and machine. Power is necessary, of course, but the ability to keep doing it without interruption is more important to the contractor. That's why Universal cranes are Waukesha equipt.

Builders of high-grade machinery, who are most jealous of the reputation of their equipment, are among those who use Waukesha engines. You cannot make a mistake buying machinery that is Waukesha powered. Ask any operator — he will tell you why. Write for "Heads," a booklet that tells why all Waukesha engines are equipt with "Ricardo Heads."

N-850-L

INDUSTRIAL EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY

Waukesha **Wisconsin**

New York	Tulsa	Houston	San Francisco
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Exclusive Builders of Heavy-Duty Gasoline Engines for Over Twenty Years

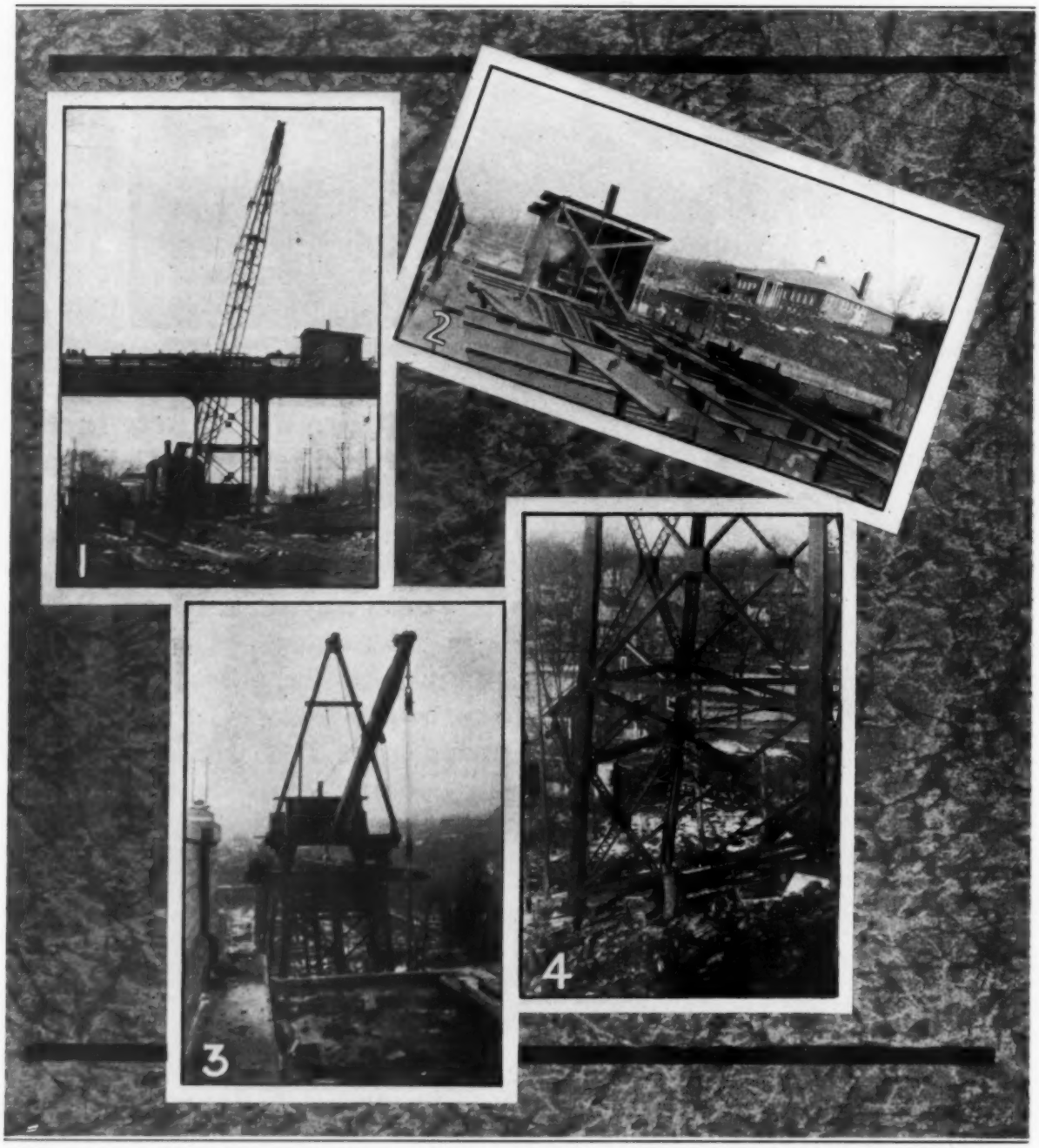
steel towers which in turn bear upon isolated concrete piers. The roadway on the structure is 30 feet wide between curbs and provision is made for a sidewalk 5 feet wide on either side.

The floor system consists of transverse beams resting upon the top flanges of the main girders and cantilevering over. The floor slab and sidewalk are of reinforced concrete, while the roadway is paved with 2-inch asphalt blocks.

The abutments are of reinforced concrete of the U-type and semi-cellular in design.

Erection was started from the north end of the structure, the steel being placed by locomotive crane and traveler from a siding of the Robert Gair Co., directly under the structure. The estimated weight of structural steel is 2,710,000 pounds.

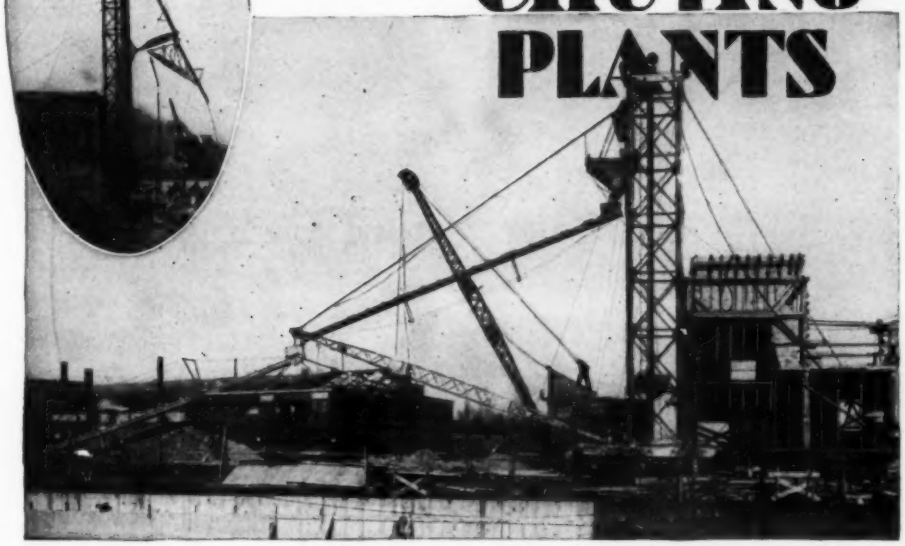
The contract price for the work is $270,634, of which New York State pays $129,304 and the Palisades Interstate Park Commission $141,330. Work has been carried on under the New York State Department of



STEEL ERECTION ON THE SPARKILL VIADUCT BY THE PHENIX BRIDGE CO.

1. Locomotive crane picking up steel from railroad siding and delivering to traveler on deck of bridge. 2. Lidgerwood steam hoist which operated small flat car on bridge delivering steel to the traveler. 3. The traveler approaching the east viaduct. 4. Steel work on slope at east end of viaduct

Ransome STEEL TOWERS & CHUTING PLANTS



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VANCOUVER, B. C.
B. C. Equipment Co.

ON the Union Station job, Buffalo, New York, the Walsh Construction Company is using a complete Ransome Chuting Plant consisting of

1 — 120 ft. Ransome Steel Tower
1 — 45 ft. Ransome Steel Tower

The 45 ft. tower is mounted on a flat car with a No. 21-S Ransome Building Mixer, overhead bins etc. *The bucket dumps through the top panel, 7½ ft. from the top of the tower proper.* The boom telescopes giving the chutes any slope from 1 to 2 to 1 to 3. Size for size, this tower is heavier, has greater strength, better distribution of metal than any other on the market.

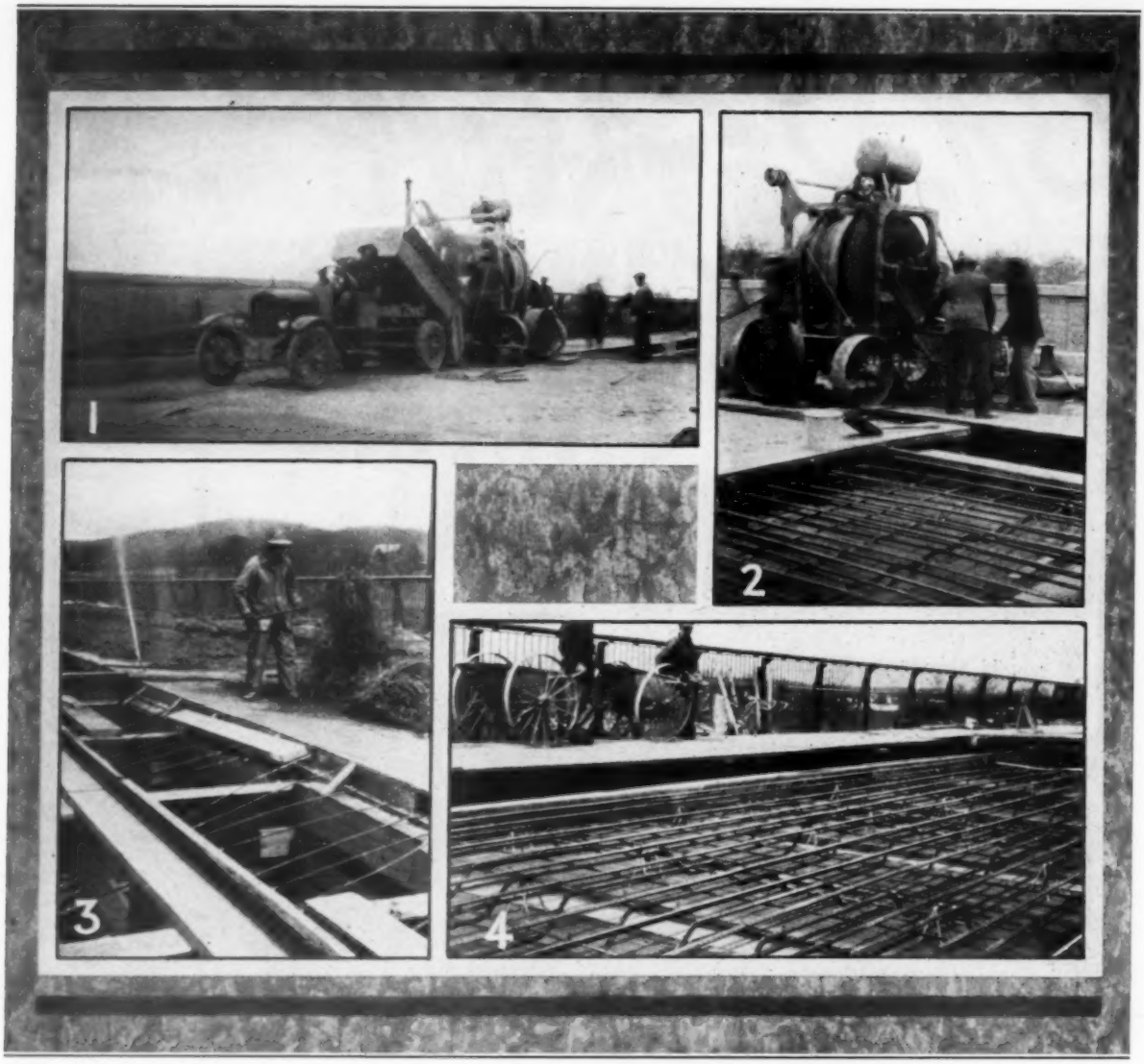
Ransome Steel Towers are the only ones that carry a boom plant with a 48 ft. counterweight chute (having its inner end tied down) and at the unsupported outer end a 48 ft. swivel head chute. Coverage!

Send today for Bulletin 203

Ransome Concrete Machinery Company

1850 — Service for 78 Years — 1928

Dunellen **New Jersey**



POURING THE CONCRETE SLAB ON THE SPARKILL VIADUCT

1. Ford hand dump trucks delivered the batch to the Koehring mixer. 2. From the mixer the concrete was buggied to the sidewalk or roadway as desired. 3. Spreading hay over the paving and spraying the previous day's covered area. 4. Detail of reinforcing steel in bridge floor

Public Works, Division of Highways, District 8, under the supervision of J. S. Bixby, District Engineer, G. L. Nickerson, Senior Assistant Engineer, N. F. Ronan, County Assistant and H. Dorfman, Engineer in Charge of the Project.

Because of the wet weather there was considerable delay in pouring the approach pavements. It had been expected that this job would be completed in time to open the Viaduct on July 4 for the heavy traffic using Route 9W north from New York City to the Bear Mountain Reservation and the Catskills. In spite of this delay the road will be open to traffic before this issue of CONTRACTORS AND ENGINEERS MONTHLY reaches its readers.

The entire steel structure has been painted gray so that the Viaduct is lost in the surrounding scenery and does not mar the magnificent view of the Hudson River and Hook Mountain to the north, which has long been enjoyed by residents of this district.

At the point where the viaduct spans the Sparkill Valley, at some prehistoric age the Palisades were torn apart by some geological cataclysm forming the valley which in 1928 has been spanned with the utilitarian structure to handle modern traffic.

***On the basis of** $7,000,000,000 **of construction for one year in the United States, of which probably one-half or** $3,500,000,000 **is payroll, the insurance cost to the industry for compensation and liability is about** $120,000,000. **Add to that for hidden losses, labor turnover, loss of wages, and interrupted production another** $120,000,000. **Prevent, by common sense, practical, educational means, one-half of the accidents, which would mean a saving of** $120,000,000.*

The Story of ACCURACY in Neptune-built Meters

CHAPTER TWO

of a Series

Accurate control of Metal temperatures

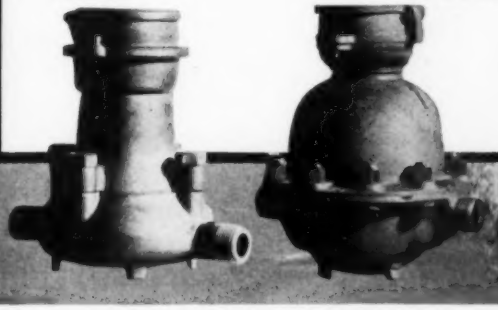
Every crucible-full of metal that goes into Trident and Lambert Meters is pyrometer-tested as it comes from the battery of electric furnaces in the foundry. This is the second step in their production—an unremitting accuracy of control that is unceasingly vigilant right down to final meter shipment. No wonder Trident and Lambert Meters are famous the world over for their *sustained accuracy* in service. Watch for Chapter Three, on "Patterns and Pouring."

Of Trident and Lambert Meters, well over 4,500,000 *made and sold the world over.*

Pioneers in Meter Progress
Yesterday—TODAY—Tomorrow

NEPTUNE METER COMPANY
THOMSON METER CORP.
50 East 42nd St., New York City

TRIDENT LAMBERT



The SYMBOL of SUSTAINED ACCURACY

"The Cash Registers of the Water Works Field"

Unusual Use of Equipment

Painton & Martin Company Uses Truck Crane to Demolish Concrete Building

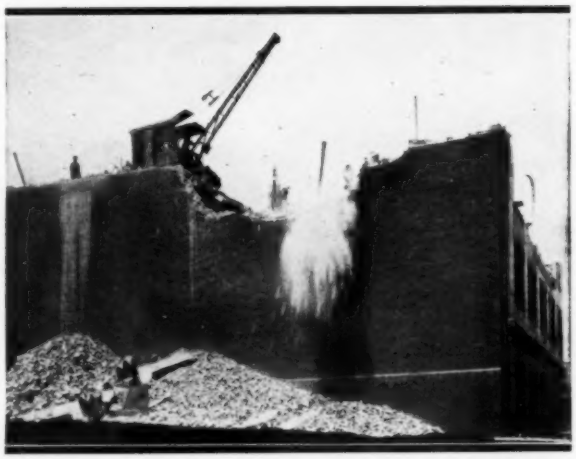
THAT it takes almost as much thought and ingenuity to wreck a building as erect one has been demonstrated by the wrecking of the Armour Building on Eagle and Ontario Streets, Cleveland, Ohio, in connection with the Union Terminal development in that city. An unusual application of equipment was attempted with success.

The wrecking work was let to C. Lurie & Co., 15th Street and Broadway, Cleveland. Mr. Lurie started work on this job with a large gang of men but because of the reinforced concrete construction of the building made very little progress until he devised a new plan with new wrecking equipment. Together with E. Painton, of the Painton & Martin Co., of Cleveland, which company operates two Universal crane units, Mr. Lurie

Crane Being Raised on Timbers to Fourth Floor by Winches on Two Motor Trucks in Foreground

worked out the application of the Universal crane for demolishing the building.

The crane, mounted on a White truck, with 20-foot boom, was raised to the fourth story of the building by running it up a ramp of two 20 x 20-inch timbers 62 feet long, which rested against the building at about 40 degrees with the ground. The crane was raised by fastening lines to the back of it, running them over snatch blocks at the top of the building and then running them down to two White winch trucks which raised the crane. The Wahl Co., of Cleveland, are the riggers who handled this job and because of the need for great care in the operation they worked very slowly and carefully. It required about seven hours to get the crane in position on the fourth floor.



Universal Crane on Fourth Floor of Armour Building Demolishing Walls with a Skull Cracker

At location on the fourth floor the crane, with a clamshell bucket, threw debris over the walls. A 3,000-pound skull cracker was used on the crane to smash up the floor panels and knock over the walls. The plan of the wrecking job with the Universal equipment was to smash all the floor panels, finally backing the crane

Equipped with a Clamshell Bucket the Universal Crane Removed Sections of the Building It Had Broken Up with the Skull Cracker

TRUSCON STEEL CO. CURB BARS

These specially rolled steel sections with their thick protecting faces are placed in the curb forms before concrete is poured and so become an integral part of the construction. They give to the curb a wear-proof, shockproof nose that is permanent assurance against cracking and chipping. Furnished in standard lengths of 8 feet, 10 feet and 12 feet and supplied bent to radius for corners.

The Complete Line of Truscon Products *for* Better Roads and Pavements

WELDED STEEL FABRIC *for* Permanence and Economy.
DOWEL CONTRACTION JOINTS *for* Eliminating Cracks.
STEEL ROAD FORMS *for* Accurate Construction.
RIB BARS *for* Supplementary Reinforcing.
CURB BARS *for* Protecting Curbs.

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TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO

into the corner and then running it down on a ramp to the next story and repeating the operation.

In order to lower the crane from floor to floor, a short ramp of 12 x 12-foot boards was set up and the crane backed into position at the top of the ramp. A winch truck on the ground was furnished with a line running to a snatch block at the top of the wall and then to the crane unit. Using the winch truck for power, the crane unit was then rolled down the ramp to the next floor. It took about four hour's time and the use of five men in addition to the 5-inch winch truck to lower the crane from the third to the second story.

Mr. Lurie, the wrecking contractor, estimates that the crane being used interchangeably with a 3000-pound skull cracker and a ½-yard clamshell bucket did the work of 90 men with picks and shovels and pneumatic drills and at a saving of about half the time originally scheduled for this job. The most easterly track of the new Cleveland Union Depot is to go underneath the present location of this building, and as this is the first one to be laid, all speed was used to get the building out of the way as soon as possible.

A Wet Day in the Superintendent's Office

SCENE: The Superintendent's Office, about 14 feet square and containing one large table, a smaller table with a typewriter, piles of papers, blueprints, time cards, cigarettes and other necessary equipment.

Dramatis Personæ: The Superintendent: a big genial individual, a quick speaker and not easily ruffled.

Jim, Clerk No. 1: Known as "My Right Hand Man," who handles the telephone, typewriter and the whole office when the Superintendent is out.

Bill, Clerk No. 2: Known as "My Left Hand Man," who handles the time cards and miscellaneous orders.

Miscellaneous hangers-on and other characters introduced as they enter.

ACTION

Supt.: "Has the way-bill come through on that sand? It is lucky for the railroad that it has rained for the last three days or they would have had a stick of dynamite put under them. Have you got the rate on moving that shovel to Bingtown yet? Call the freight agent."

Jim puts through the call and reports. "They can't give us a rate on that. You better go down and see the division freight agent yourself."

Enter Sam, a lean and hungry looking negro, late laborer for the Supt. "Say, Boss, have you-all heard of any job I could get hereabouts?"

Supt.: "Well, they are building a schoolhouse up the line about a mile and you might get in there. Good luck." Exit Sam.

Enter two young boys recently laid off as truck drivers. "Say, Boss, could you use us as soon as it dries up again?"

Supt.: "Not a chance, boys; sorry to let you go but the job will be closed up by the end of the week if The Almighty will only go easy on the rain."

Boys: "Do you know of anyone that wants any truck drivers?"

Supt.: "There's a man over in Cross Water Junction that was looking for some truck drivers last Thursday. Might try him, it's only 15 miles over and you could get a hitch."

Boy No. 1: "Thursday, Friday, Saturday, Monday, guess he's got all the men he wants by this time."

Boy No. 2: "It's worth trying—good drivers is scarce."

Enter Sam: "Whar you say that job was, Boss? Ah has looked all over town and it's rainin' hard and Ah hain't seen it."

Supt.: "Now, Sam, you just go up three blocks to the big white church and then on the south road as far as the brick barn and turn right and walk about half a mile; you can't miss it."

Sam: "Thanks, Boss, Ah'll go look again."

Bill: "Say, Boss, here's two cards for 2683 for last week Friday. Did he do a double trick?"

Supt.: "Ask the foreman; I thought he was let out after noon."

Boy 1: "Do you think that man might still have a job for a driver?"

Supt.: "How do I know? Go find out."

Enter Tony (rather wet): "I tooka out two a tha shovel to open the drain. Too mucha da wet to worka da more."

Supt.: "Good for you, Tony, call it a day. You did better than most of the boys."

"Gooda bye."

Supt.: "Damn fine boy, Tony; wish all wops were as good as him. Let me see the time sheets for last week. We are near the end of the job with only 750 feet to pour. Is 2487 the big Swede with the dancer on his arm? Hold him for the shoulder work, he's good at that. For goodness sake let Frenchy go and I hope he never hears of another contract we land. Might as well ask the state to pay us double our bid as to land a job without his showing up the first day. He is a decent chap, but he can't work hard enough with his bad wind."

Enter Sam (very wet): "Ah went up the road and turned down where the white barn was and couldn't find the brick church."

Supt.: "Confound you, Boy! I said the white church and the brick barn. Try again. Jim, with those two 5-ton trucks laid up and the grading job to start on 482 week after next we had better have a session with Motorcar Truck people and the Black crowd to see what we can do for the fleet we'll need at the start. Don't let 'em both land here the same day or I'll go mad. Better try the Motorcar people first. I like their stuff better."

And so it goes for the entire afternoon, with a procession of Sams, truck drivers and others that the Superintendent wants to see get a job, but he is too busy to offer more than a hint of a chance. Freight bills, work orders, extras to take up with the chief inspector, a bit of a difference over the grade at station 96-32, but that is settled in a minute without a discordant note. It's all in the wet day's work of the Construction Superintendent.

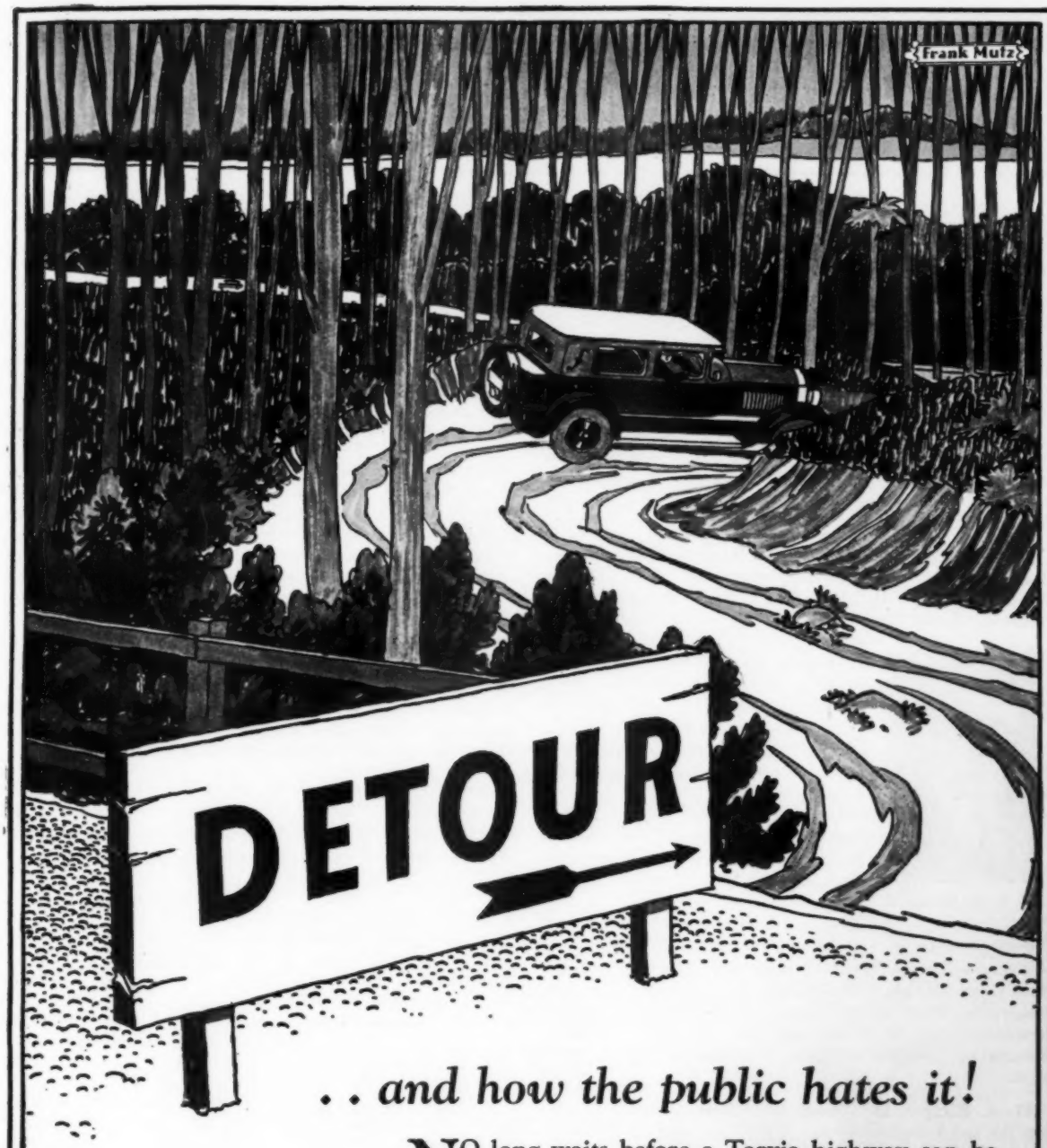
Enough Punishment

"PAT" BRESSELLI had been working for some time on a State road job west of Brookville, Pa., but had never been able to get along well with his foreman. One day a blast a little bigger than usual was set off to remove some ledge. Pat did not move back as far as the rest of the labor gang and a large piece of rock landed at his feet.

The foreman went over to Pat and asked him why he did not move farther away with the rest of the gang. He said, "Pat, aren't you afraid you will be killed when one of those shots goes off? You are not ready to die yet." "Oh, yes, I am," said Pat, "I am just as ready to die now as I ever will be in all my life."

"But," said the foreman, "you don't want to die, you might not get into heaven." "Yes I will, and don't you forget it," said Pat, "I'll go sailing up there and when St. Peter sees me coming he'll ask me who I am, and who I worked for and who was me foreman. Then when I tell him you was me foreman he'll say to come right in, I have had enough hell on earth."

The foreman turned red and then laughed and took it well. Since then they have been better co-workers. It pays to get a grudge out of your system; you can work better.



. . and how the public hates it!

NO long waits before a Tarvia highway can be opened—no long periods of curing after Tarvia construction.

When a Tarvia road is down, it's open.

Note: Even where detours are necessary, with Tarvia construction they are of short duration.

Tarvia
For Road Construction Repair and Maintenance

The Barrett Company

New York	Chicago	Minneapolis	Cleveland	Philadelphia	Boston
St. Louis	Salt Lake City	Baltimore	Toledo	Cincinnati	Bethlehem
Detroit	Milwaukee	Providence	Buffalo	Birmingham	Kansas City
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In Canada

THE BARRETT COMPANY, Limited, Montreal, Toronto, Winnipeg, Vancouver.

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

W. A. Crary & Son, Columbia, S. C., 1226 Sumter Street. Organized August, 1922. Bus. vol. D. Officers: W. A. Crary, Sr. and W. A. Crary, Jr., partners. Major contracts: Cope High School, Cope, S. C.; Orangeburg County Court House, Orangeburg, S. C.; A. R. P. Church, Due West, S. C.; University of South Carolina Library Building, Columbia, S. C.; Second Baptist Church, Columbia, S. C.; North School, North S. C.; Shandon Episcopal Church, and Shandon Graded School, Columbia, S. C. Member: Columbia Builders Exchange, Columbia, S. C., and the South Carolina Branch of the A. G. C. of A.

Raymond Concrete Pile Co., New York, 140 Cedar Street. Branch offices: Atlanta, Ga.; Baltimore, Md.; Boston, Mass.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Houston, Texas; Kansas City, Mo.; Los Angeles, Calif.; Miami, Fla.; Pittsburgh, Pa.; San Francisco, Calif.; Alameda, Calif.; Buffalo, N. Y.; Milwaukee, Wis.; Philadelphia, Pa.; St. Louis, Mo.; St. Paul, Minn.; Washington, D. C.; Hong Kong, China; London, England; Montreal, Canada. Organized August 18, 1902. Bus. vol. A. Officers: M. D. Hull, President; M. M. Upson, Vice-president and General Manager; H. R. Moyer, Vice-president and Treasurer; Wm. V. McMenimen, Vice-president; J. W. Taussig, Vice-president; P. D. Case, Secretary. Major contracts: Pontchartrain Bridge, New Orleans, La.; San Mateo Bridge, San Francisco, Calif.; Boca Ceiga Bridges, Florida; Port Development, Maracaibo, Venezuela; Port Development, Buenaventura, Colombia, Recreation Pier, St. Petersburg, Fla. Member: Merchants Association, National Chamber of Commerce, and A. G. C. of A.

W. V. McMenimen

W. A. Klinger, Inc., Sioux City, Iowa, Warnock Building, 7th and Douglas Streets. Organized 1925. Bus. vol. C. W. A. Klinger, who formerly had been President of Steinhagen & Klinger, Inc., of Milwaukee, Wis., organized the business as an individual in 1919. Officers: W. A. Klinger, President and Treasurer; Jas. R. Bowler, Vice-president; Clyde C. Younglove, Secretary. Major contracts: 1923-4-5, reconstruction of yards and pens of the Sioux City Stock Yards Co.; 1925, produce plant for Swift & Co., Huron, S. D., and Bellevue Apartment Homes, Sioux City, Iowa, 1926, produce plant for Swift & Co., Sioux City, Ia.; Hotel Norfolk, Norfolk, Nebr., Commodore Apartments, Norfolk, Nebr.; 1927, warehouse and garage for the Sioux City Gas & Electric Co., and produce plant for the Hanford Produce Co., Sioux City, Iowa. Member: President of Sioux City Chamber of Commerce, American Concrete Institute, Sioux City Master Builders Association and the Central Branch of the A. G. C. of A. Mr. Klinger is a Director for the Eleventh District of the A. G. C. of A., consisting of Iowa, Nebr., Kans., Mo., Wyo. and Colo.

J. C. Hammond, Erie, Pa., 1005 Ariel Building. Organized 1921. Bus. vol. E. Officers: J. C. Hammond, sole owner. Major contracts: 1925, woodworking shop for the General Electric Co., Erie, Pa., $45,000, and warehouse for the General Electric Co., $150,000; 1926, N. Y. C. and Penna. R. R. bridge at Erie, Pa., $30,000, pump house of the Hammermill Paper Co., Erie, Pa., $15,000, reservoir and filter for the Hammermill Paper Co., $10,000, finishing building for the Hammermill Paper Co., $60,000; 1927, alterations to McCrory Stores Corp., Erie, Pa., $45,000 and Weil-McLain Co. foundry at Erie, Pa., $180,000. Member: A. G. C. of A.

Winston Bros. Co. & H. H. Wilson, Minneapolis, Minn., Globe Building, and Harrisburg, Pa., Masonic Building. Organized 1927. Bus. vol. B. This is a joint construction association between Winston Bros. Co. of Minnesota and Henry H. Wilson, of Harrisburg. It is interested at present in the construction of bridges over the Ohio River at Point Pleasant and St. Marys, W. Va., and at Dievers, Va. Prior to 1927 Mr. Wilson was connected with Winston & Co., and Winston & Co., Inc., of Kingston, N. Y., and Richmond, Va., as a special partner on construction work. Winston Bros. Co. was incorporated in Minnesota in 1902, taking over the business of the partnership of Winston Bros.., who began contracting work in 1875. Officer: Henry H. Wilson, Manager. Member, Penna. and National A. G. C. of A.

Rock City Construction Co., Nashville, Tenn., 150 Fourth Avenue, North. Organized September, 1913. Bus. vol. D. In 1916, all of the stock of the company was purchased by J. W. N. Lee and in 1923 the corporation charter was surrendered. Since that time the business has been conducted under the same name with Mr. Lee as sole owner. Major contracts: 1924, Printing House, M. E. Church, South, Nashville, Tenn.; 1925, Southwestern College dormitories, dining hall and kitchen, Memphis, Tenn.; 1926-27, Scarritt College for Christian Workers, Nashville, and Southern College of the Y. M. C. A., Nashville; 1927, liberal arts, physics and biology buildings of Vanderbilt University, Nashville. Member: Local and national Chamber of Commerce, and local and national A. G. C. of A.

Ware Co., El Paso, Texas, 1614 E. Missouri Street. Branch office: 801 Masonic Temple, New Orleans, La. Organized January, 1924. Bus. vol. C. This company succeeded V. E. Ware, contractor. Officers: V. E. Ware and H. T. Ware, partners. Major contracts: 1925, engine terminals for the Texas & Pacific Railway at Dallas, Texas, Shreveport, La., and Alexandria, La., $750,000; 1926, engine terminal for the Texas-Pacific Missouri-Pacific Terminal R. R. of New Orleans at Gouldsboro, La., $400,000, depots and section buildings for the Southern Pacific Co. at Edinburg, McAllen and Harlingen, Texas, $200,000; 1927, bridges for the Highway Department of New Mexico, $50,000, bridges for the County of Cochise, Ariz., $75,000, ice plant for the Pacific Fruit Express, Edinburg, Texas, $200,000, section houses for the Gulf Colorado and Santa Fe Ry., $150,000. Member: A. G. C. of A.

Clark Brothers Construction Co., Cherry Tree, Pa. Organized April, 1922. Bus. vol. E. Officers: A. B. Clark, Pres.; L. Steel Clark, Sec.-Treas. Major contracts: all Pennsylvania state highway work. Member A. G. C. of A.

Solvay Surface Cured Road
in Illinois

Solvay Integral Cured Road
in Connecticut

The 2 Advanced Road Curing Methods

Roads Opened in Half the Usual Time

Either spread on the surface or used as an integral part of the mix, Solvay Calcium Chloride brings definite advantages to the building of better concrete roads.

It eliminates the need for constant sprinkling and inspection. Used integrally, it cures uniformly throughout the mass.

Concrete roads cured with Solvay Calcium Chloride can be opened to traffic in half the usual time, because Solvay gives the concrete great early strength.

Solvay Calcium Chloride is a sure cure for curing troubles. It is fast, dependable, clean, convenient and economical. There's no necessity for a final cleaning up after it has been used. No skilled labor is needed.

SUCCESSFUL PERFORMANCE A.G.C.-A.E.

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Flake 77%—80%

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40 Rector Street New York City

W. M. Bardo, Toledo, Ohio, 2105 Robinwood Avenue. Organized 1920. Bus. vol. E. Major contracts: commercial biuldings, both new and remodeled, and residences. Member: Toledo and National Chapters of the A. G. C. of A.

McKenzie Construction Co., San Antonio, Texas, 716 Travis Building. Branch office: 707 Santa Fe Building, Dallas, Texas. Organized 1912. Bus. vol. B. This company was organized as McKenzie-Williams Construction Co., a Missouri corporation. In 1919, a partnership known as McKenzie Construction Co. of Texas was organized which was incorporated as the McKenzie Construction Co. in the State of Texas. Officers: Thos. McCroskey, President; A. J. McKenzie, Vice-president and General Manager; E. W. Robinson, Secretary and Treasurer. Major contracts: 1925, Hilton Hotel, Dallas, Texas, $450,000, H. & T. C. Ry. structures, Dallas, $275,000, Garrison Hall of the University of Texas at Austin, $350,000, Sanger Apartment, Dallas, $600,000; 1925-7, Ft. Worth sewers, Fort Worth, $416,000; 1926, Olmos Dam, San Antonio, $1,000,000, Littlefield Dormitory for the University of Texas, $350,000, A. B. Frank Building, San Antonio, $400,000; 1926-7, Plaza Hotel, San Antonio, $1,500,000; 1927, Medical Arts Annex, Dallas, $450,000, and water-works at Laredo, $175,000. Member: San Antonio Chamber of Commerce, and A. G. C. of A.

Berkebile Bros., Johnstown, Pa., Main Street. Organized January, 1914. Bus. vol. B. This firm was started in 1914 by the present partners, Louis E. and Foster H. Berkebile. Major contracts: Central High School, Johnstown, Pa., $1,300,000; Public Safety Building, Johnstown, Pa., $500,000; Westmont Presbyterian Church, Johnstown, Pa., $200,000; Masonic Building, Latrobe, Pa., $250,000; National Radiator Corp., Johnstown, Pa., $125,000; Juniata College, Huntingdon, Pa., $125,000. Member: A. G. C. of A.

Monarch Engineering Co., Denver, Colo., 1st and Larimer Streets. Organized 1908. Bus. vol. C. This firm was originally organized in 1900 by John A. Crook, and reorganized in 1908, taking in Guy A. Crook. The company is owner of The Denver Steel & Iron Works Co., Denver, Colo., Falls City, Nebr., being their eastern office. Officers: John A. Crook, owner; Guy A. Crook, in charge of the Nebraska office. Major contracts: steel bridges over Snake River, Jackson Hole, Wyo., Rio Grande River, Chamita, N. Mex., Valley Falls, Kans., Arkansas River, Fowler, Colo., San Juan River, Bloomfield, N. Mex., and also one at Farmington, N. Mex., over the San Juan River, road construction in Humboldt, Nebr.; steel construction on West Denver High School, Denver, Colo. Member: American Institute of Steel Construction, Amer. Soc. C. E., and A. G. C. of A.

The Berlin Construction Co., Inc., Berlin, Conn. Branch offices: 220 Broadway, New York, and Springfield, Mass. Organized January 1, 1901. Bus. vol. B. The operations of the company have covered all of the New England States, Eastern New York, Pennsylvania and New Jersey. Officers: Charles F. Chase, President; L. H. Brumbaugh, Vice-president; Charles W. Heusted, Treasurer; W. H. Fitzell, Secretary. Major contracts: August, 1925, bridge at Gaylordsville, Conn., for the Connecticut State Highway Department; December, 1925, towers at Providence, R. I., for the Narragansett Electric Lighting Co.; March, 1927, tower at Fall River, Mass., for the Montaup Electric Co. Member: American Institute of Steel Construction, Manufacturers Association of Connecticut, and Hartford Chamber of Commerce.

Henry B. Davis, Washington, D. C., 1311 G Street, N. W. Organized October, 1914. Bus. vol. E. Mr. Davis is owner of this business. He started his work as draftsman, working under Smithmeyer and Pelz, from 1889 to 1891. He worked on the drawing for the Library of Congress, also on the Hotel Chamberlain at Old Point Comfort. Has designed and superintended construction various public and private buildings. For seven years was Chief Inspector of Plumbing, was Secretary of Samuel J. Prescott Co., contractors and builders, resigning in 1914 to enter business for himself. Major contracts: two additions to reinforced concrete buildings for the Government at the Agriculture Experimental Farm under two separate contracts; constructed public comfort station at the Arlington Cemetery, Va.; school building and auditorium at Cherrydale, Va.; new buildings and addition to old of the Deanwood School; addition to the Henry F. Cook School; Georgetown University Hospital; and many fine residences. Member: Builders and Manufacturing Exchange, and Washington City Club.

N. P. Severin Co., Chicago, Ill., 222 W. Adams Street. Branch office: Washington, D. C. Organized 1890. Bus. vol. B. N. P. Severin was sole owner until about 1912 when his son, Enoch Severin, was taken in as partner. Upon the death of the son in 1917, A. N. Severin, another son, was taken in as partner and shortly thereafter N. P. Severin retired from active management. Major contracts: 1923-1927, Evanston Township High School, Evanston, Ill., $2,500,000; 1925, Stadium, Oak Park, Ill.; 1926, Masonic Temple, Evanston, Ill., $500,000, and U. S. Veterans Hospital, North Chicago, Ill., $1,000,000; 1926-1927, M. N. Rothschild Estate, Glencoe, Ill., $1,000,000; 1927, Haven Intermediate School, Evanston, Ill., $1,000,000, U. S. Hospital at Sunmont, N. Y., $300,000, and reconstruction of the "White House" at Washington, D. C., $300,000; 1928, U. S. Veterans Hospital, Portland, Ore., $1,500,000, Court House, Utica, N. Y., $600,000, and Christian Scientist Church, Washington, D. C., $400,000.

N. P. Severin

Basil P. Kennard, Jacksonville, Fla., 2117 Ernest Street. Organized August 1, 1917. Bus. vol. E. This is a personal ownership, Mr. Kennard having been associated with L. M. Boykin from 1906 to 1917. Major contracts: 1926, School No. 147 for the B. of P. I., Duval County, Fla., $140,000; 1925, Napier Apartments, $85,000; also sundry commercial buildings and school extensions.

Burford, Hall and Smith, Atlanta, Ga., 187 Spring Street, N. W. Organized October, 1919. Bus. vol. D. This company is a partnership of Roland B. Hall and Samuel H. Smith, specializing in engineering construction and machinery sales. The construction is limited to mechanical and electrical work involved in steam electric power plants, pumping and hydro-electric plants. Major contracts: pumping plants for Tampa, Fla., Macon, Ga., Knoxville, Tenn., Ft. Lauderdale, Fla., and Atlanta, Ga.; equipment for sewage disposal, Ft. Lauderdale, Fla.; hydro-electric and pumping plant for Spartanburg, S. C. Member, National Engineering Societies.

A. P. Munsen, Marion, Iowa. Organized 1915. Bus. vol. E. This is a personal ownership operating in Iowa, Missouri and Illinois, and building bridges of all types and of moderate size, the largest single structure amounting to about $60,000. For the last three or four years, the greater part of the business has been done in Illinois on state road work. Member: Central Branch of the A. G. C. of A. at Des Moines, Iowa, also the Illinois Chapter, known as the Illinois Association of Highway and Municipal Contractors.

AGAIN
and AGAIN *you have shattered our* tonnage record
each month!

THAT each successive month establishes a new tonnage record for shipments of *Carey Elastite Expansion Joint* is, of course, very gratifying to us. That the nation's leading contractors and road builders so heartily endorse this great construction improvement naturally brings to us, its makers, a glow of pride, a sense of accomplishment, the satisfaction of work well done.

For we know that, in Carey Elastite Expansion Joint, responsible engineers recognize the achievement of a solid, substantial company with a record of more than fifty years of service. An indispensable construction improvement—a product of the very highest quality, made of the best and most carefully selected materials.

Carey Elastite Expansion Joint! The logical, lasting protection for concrete work. The unfailing safeguard for the professional reputation of the construction engineer.

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Elastite Expansion Joint

. . . absorbs expansion and contraction, prevents overstresses in the structure, protects concrete against breakage, and extends its length of service.

. . . will not melt in hot weather, nor will it become brittle in cold weather. It lasts as long as the concrete.

. . . reduces maintenance expense and adds but a trifle to the cost of construction. Conveniently installed, for the preformed strips are as easy to handle as a board.

THE PHILIP CAREY COMPANY
Lockland, Cincinnati, Ohio

Carey Elastite
EXPANSION JOINT

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Liability on Checks

A contractor sends a check to a creditor in another city in payment for supplies, having ample funds in the bank to cover it. But, alas and alack, after the check gets back to the bank, but before the remittance is made on it, the institution bursts because the cashier ran away with all the cash, and a blonde who did not prefer a gentleman, or because the assets or the bank froze too hard, or for some other reason.

There is no Alphonsing and Gastoning between the contractor and the creditor. The contractor insists that he has paid his bill, although willing to give the creditor whatever dividend he may receive on the amount of his deposit represented by the check. But the creditor says that receiving the check was impliedly conditioned upon its being paid when presented. So, he insists that the loss falls on the contractor.

According to a decision handed down by the Mississippi Supreme Court, January 9, 1928, in the case of Marine Bank & Trust Co. vs. Triplett, 115 So. 202, the contractor is in the clear. That court said:

"The bank to which a check is sent for collection is the agent of the holder of the check for the purpose of making the collection, and the payment of such check absolves the drawer from further liability thereon. The bank on which the check is drawn is not the proper agent to which the check may be sent for collection. When a check is received for collection by the bank on which it is drawn, and the drawer then has sufficient funds on deposit with such bank with which to pay the check, the drawer will be discharged from further liability on the check although the bank fails to pay the amount of the check to the holder thereof from whom it was received, notwithstanding the bank may be then insolvent, provided it was then open for business and it does not appear that, in the event the check had been presented to it by another collection agent, it would not have been paid."

A Vital Aspect of Cost Plus Contracts

Very important is the decision handed down by the Arkansas Supreme Court March 20, 1922, in the case of Buckeye Cotton Oil Co. vs. Kaucher, Hodges & Co., 238 S. W. 1. It dealt with the responsibility of a contractor for increased building cost to the owner due to inefficient labor employed.

Defendants contracted to erect for plaintiff a reinforced concrete building near Little Rock "for a compensation equal to 8 per cent of the actual construction cost." They guaranteed that the cost should not exceed $76,463, subject to this condition:

"This guaranty is made during existing conditions and does not apply should the work be interfered with or cost increased by any act of government or any unforseen elements or acts of God."

The building costs more than $20,000 more than the estimated cost, and the owner sued to compel the contractors to reimburse it for the excess cost. The defense interposed was that the increased cost resulted from changed conditions respecting prices of labor and material and inefficiency of labor.

The court upheld the defense so far as concerned increased cost of labor based on increased wage scales, but not as to increased cost due to mere inefficiency of labor employed. Referring to the terms of the guaranty above mentioned, the court says:

"What the language means is that, if there was any increase in the cost of the building aside from those causes stated in the exceptions, appellants [the contractors] should be responsible for it under their guaranty. Now, the language of the exception does not, include any estimated increased cost by reason of the inefficiency of labor. The increased cost of labor and materials was easily ascertainable and was within the contemplation of the parties at the time the contract was entered into.

"It was their manifest intention to exempt appellants' liability on account of increased cost of the building from those causes. But the question of the inefficiency of labor is a thing so vague that it could not have been within the contemplation of the parties that an estimate should be taken of the degree of inefficiency of labor during the construction of the building.

"In fact, that was one of the things appellants undertook to do and were paid to do in selecting the right kind of labor, and there is no proof in this case which would justify the finding that they could not have done that so as to reduce to a minimum in degree the inefficiency of labor."

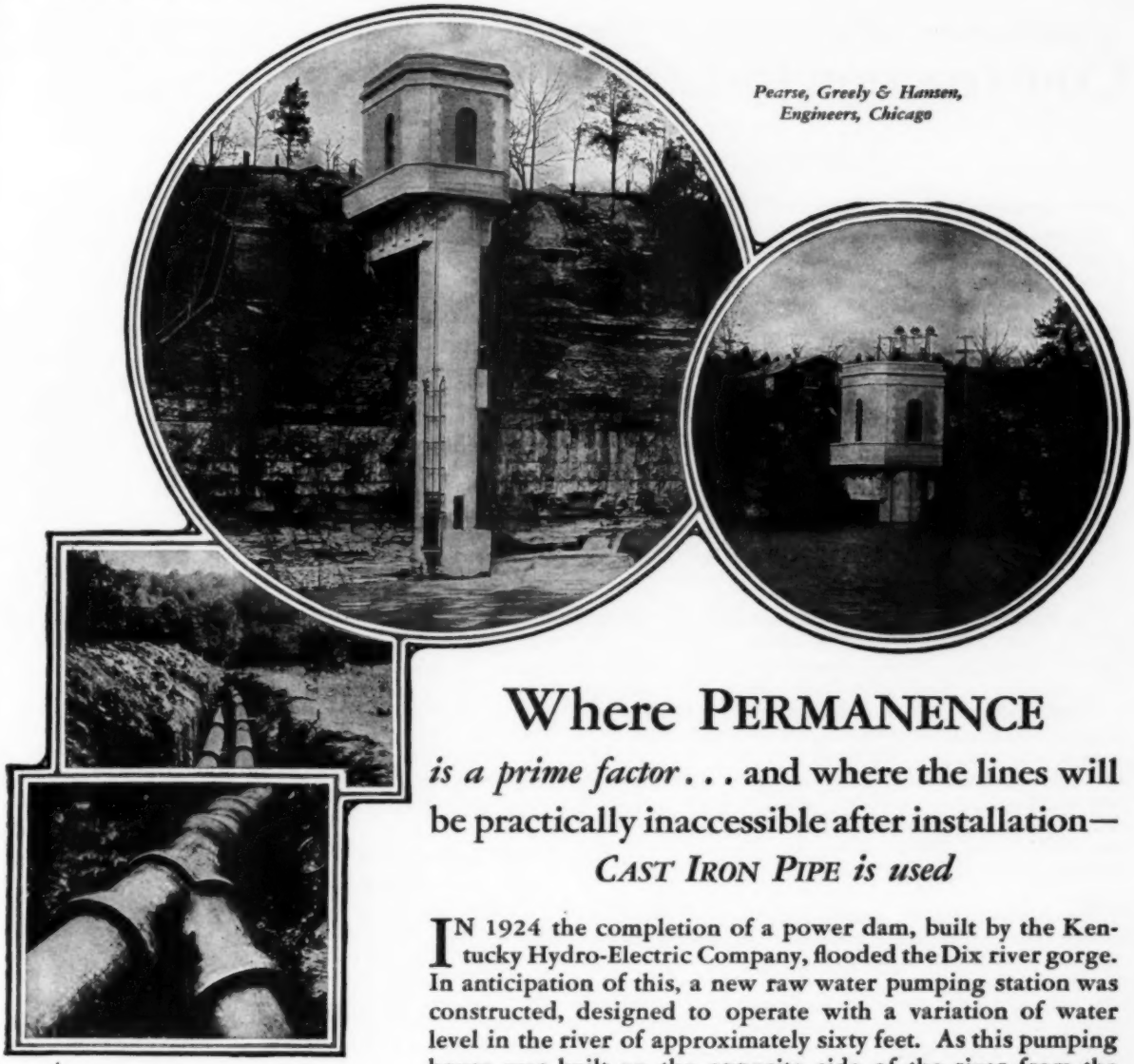
Discharging an Attorney

If the contractor shares the misconception held by the average layman, he mistakenly supposes that it is more difficult to get rid of an attorney who has been hired than to get rid of his wife.

As decided by the California Supreme Court in the very recent case of Kirk vs. Culley, 261 Pac. 994, a client ordinarily has a right to dismiss his attorney any time, the same as he has a right to dismiss any other sort of agent. But, of course, if the dismissal involves inexcusable breach of an unperformed contract for services, the dismissed attorney has a good claim for damages based on the loss resulting to him from his dismissal, in addition to recovering for services rendered before dismissal. The California court holds that the right to dismiss is not defeated by the fact that the attorney may have been employed to act in a certain matter for a contingent fee.

Louisiana Highway Contractors' Bonds

The statutory bond required to be given by highway contractors in Louisiana, securing payment for work and materials furnished them in the performance of contracts, protects sub contractors, holds the Louisiana Supreme Court in the cases of Silver vs. Harriss, 115 So. 376, 380, decided October 31, 1927. But the liability is limited to the penal sum fixed in the bond. It was further decided that such bonds cover compensation due the contractor's foremen, but not the traveling expenses of such foremen; and that the bond does not cover groceries, etc., furnished the contractor for personal use and sale to his employes and others.



Pearse, Greely & Hansen, Engineers, Chicago

Where PERMANENCE

is a prime factor . . . and where the lines will be practically inaccessible after installation—

CAST IRON PIPE is used

IN 1924 the completion of a power dam, built by the Kentucky Hydro-Electric Company, flooded the Dix river gorge. In anticipation of this, a new raw water pumping station was constructed, designed to operate with a variation of water level in the river of approximately sixty feet. As this pumping house was built on the opposite side of the river from the city, a pipe line crossing became necessary. Two substantial parallel lines were built under the river, joined to form one supply line on the shore. Because of the almost impossible task of reaching these lines for repairs after the dam had been filled, Bell and Spigot Cast Iron Pipe was used.

Much helpful data for the engineer and contractor is contained in the U. S. Cast Iron Pipe Handbook. May we send your copy now?

Makers of deLavaud Centrifugal Cast Iron Pipe PATENTED

United States Cast Iron Pipe and Foundry Company

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San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th Street & Hennepin Avenue

Construction Industry News

The Chain Belt Co., Milwaukee, Wis., has announced the addition to its sales organization of Charles H. Upson, who for the past twenty-three years was District Manager for the Dodge Manufacturing Co. Mr. Upson will have his headquarters at 909 Traction Building, Cincinnati, Ohio.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., through T. E. Doremus, Manager of the New York Explosives Office, has announced that in consideration of the unusual term of service of Joseph Lang, who has represented the du Pont Co. in the New York City territory, R. H. Nicol, one of the senior representatives, has been transferred to the New York City territory, and will relieve Mr. Lang of such duties as he may desire to relinquish. Mr. Nicol has been in the organization for twenty-five years.

The Building Trades Employers' Association of the City of New York, 2 Park Avenue, has started an accident prevention campaign to reduce casualties on all structures. The Association plans an extensive educational movement to lessen injuries and to reduce insurance premiums by heading a committee that will induce the public, architects, contractors, and labor bodies to cooperate. Christian G. Norman is Chairman of the Board of Governors, and $15,000 annually has been appropriated to carry out the plans. H. W. Lohmann, Vice-president of James Stewart & Co., Inc., has been chosen Chairman of the Accident Prevention Committee.

The Seventh Annual Asphalt Paving Conference, together with the Annual Convention of the Association of Asphalt Paving Technologists, will be held at the Roosevelt Hotel, New Orleans, La., during the week of December 10, 1928. John M. Klorer, Commissioner of Property and Public Works of that city, has accepted the Chairmanship of the Local Committee.

The Joseph Dixon Crucible Co. has announced the new address of their Chicago sales office, which is now located at 2003 Builders' Building, Wacker Drive and La Salle Street.

The American Concrete Institute, 2970 West Grand Boulevard, Detroit, Mich., will hold its 25th Annual Convention at the Book-Cadillac Hotel, Detroit, February 12, 13 and 14, 1929. A program of eight technical sessions is already under way.

Graham Brothers, the Truck Division of Dodge Brothers, Inc., Detroit, Mich., has announced a complete line of 6-cylinder trucks and commercial cars with larger capacities, longer wheel bases, 4-wheel brakes and many improvements in motive power, construction and appearance. The new line ranges in size from the Merchants Express to the 2½-ton size.

The T. L. Smith Co., Miwalukee, Wis., has announced the appointment of the Newlin Motor Co., of Kansas City, Mo., as its distributor for the western half of Missouri and the eastern half of Kansas. This company will handle the entire line of Smith construction mixers, while the Smith paver will be handled as before by the Bublitz Machinery Co.

The American Road Builders' Association, Inc., National Press Building, Washington, D. C., has accepted an invitation from the Mexican Federal Highway Commission and Government to take part in the Second National Highway Congress to be held in Mexico City, October 3-6, 1928. The various Mexican states will be represented by exhibits and take part in the Congress and Exposition.

Col. R. S. Beightler

Col. Robert S. Beightler has been appointed Chief Engineer of the Ohio Department of Highways, succeeding Harry J. Kirk, who has been appointed Director of the Department. Col. Beightler has had extensive experience as a highway engineer, and has been connected with the Ohio Department of Highways for the past eight years. He was Division Engineer in the Cincinnati District and later in the Columbus District. In 1923 he was promoted to the position of Assistant Chief Engineer of Construction and again in 1925 to Chief Engineer of Construction. Mr. Kirk has been with the Ohio Department since 1913, serving as Division Engineer, Maintenance Engineer and Chief Engineer, which latter position he held for the last three years. Mr. Kirk will have charge of a program involving the expenditure of $30,000,000 in 1928, comprising the maintenance of the 11,000-mile state highway system and the construction of 600 miles of new pavement.

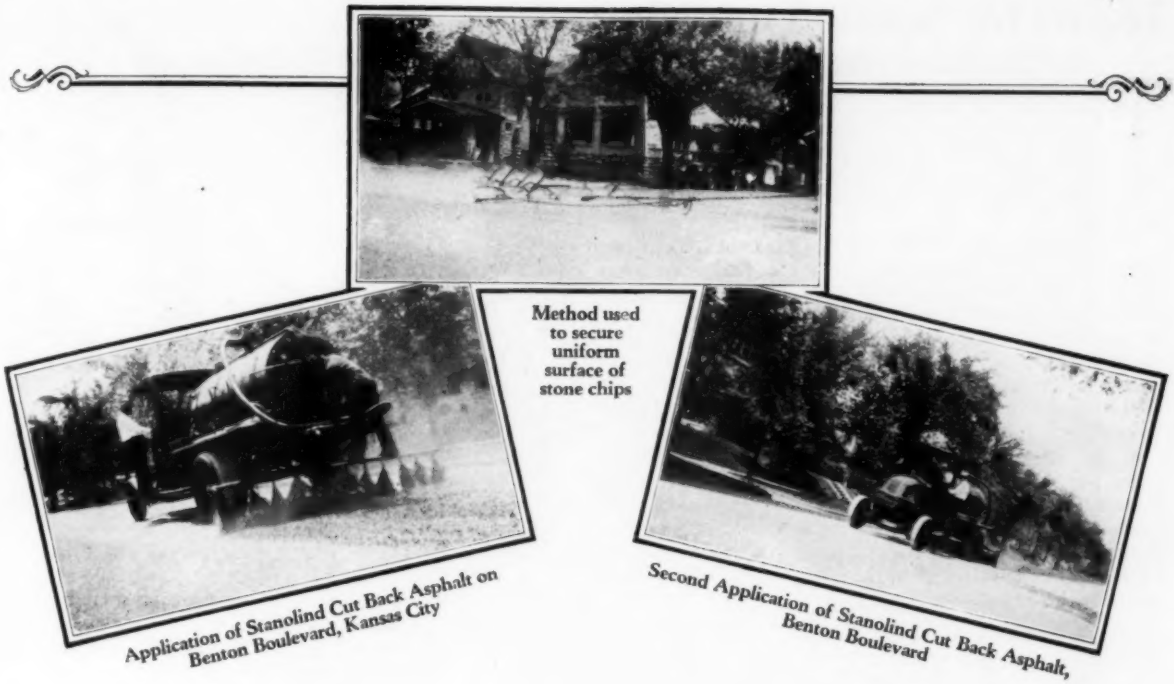
The Lakewood Engineering Co., Cleveland, Ohio, has announced its purchase of the Walker patents on hand finishing belts. These belts, made of specially prepared rubberized canvas, are equipped with wooden handles at each end. The belt material is the same as that which is used on the Lakewood screed.

The Heil Co., Milwaukee, Wis., through Clement C. Smith, has announced the consolidation of that company with the Hydro Hoist Co., a subsidiary. Mr. Smith is now Chairman of the Board of Directors of the consolidated company. J. P. Heil, formerly Vice-president and Treasurer of The Heil Co., has been elected President and Treasurer; Herman W. Falk, Vice-president, and W. M. Chester, Secretary. The Heil Co., in addition to a group of modern factory buildings on eighteen acres of ground at Milwaukee, has branch factories in Boston, New York, Philadelphia, Cleveland, Detroit and Chicago. About a year ago the company completed a quarter of a million dollar building program, which now gives their factory a total floor space of 214,000 square feet.

The R. B. George Machinery Co. recently moved into a new and spacious building located at 1135, 36 and 37 South Lamar Street, Dallas, Texas.

The Pennsylvania-Dixie Corp., New York, has announced that Blaine S. Smith has resigned as Vice-President of the Universal Portland Cement Co. to become President of the corporation, succeeding John A. Miller, who becomes Chairman of the Board.

The Hunter Machinery Co., 16th St. Viaduct, Milwaukee, Wis., has been appointed exclusive distributor for the states of Wisconsin and Michigan for the Archer line of tubular towers and spouting equipment. W. G. Weimer, formerly in the equipment distributing business in Fort Wayne, Ind., has joined the sales force of the Hunter Machinery Co., at Grand Rapids, and is covering the southern Michigan territory east as far as Jackson. Arthur Neff, for a number of years engaged in paving, sewer and water work construction in Detroit, has joined the Hunter Machinery Co. sales force at Detroit.



Method used to secure uniform surface of stone chips

Application of Stanolind Cut Back Asphalt on Benton Boulevard, Kansas City

Second Application of Stanolind Cut Back Asphalt, Benton Boulevard

Stanolind Cut Back Asphalt

Asphalts for Every Purpose

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Peoria	KANSAS	Sioux City	Grand Rapids				
Quincy	Wichita		Saginaw				

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Hoists for Sewer Tunneling Jobs

THREE single-drum, electric powered hoists manufactured by the Novo Engine Co., 204-216 Porter Street, Lansing, Mich., are being used by Louwers and Somerville, of Detroit, on sewer tunneling jobs in that city. These "NH" hoists were arranged to handle both spoil and sewer lining materials.

A head frame was erected over the excavation, and at one side, half way up, a bin was built. This bin held the excavated material. The trucks were loaded by gravity from this hopper. Above the hopper was a truck and small industrial car, serving the purpose of a platform for the spoil bucket to drop on, which action emptied the spoil bucket. The car was rolled aside while the spoil bucket was being hoisted to the top of the head frame, the hoist operator controlling both the spoil bucket and car.

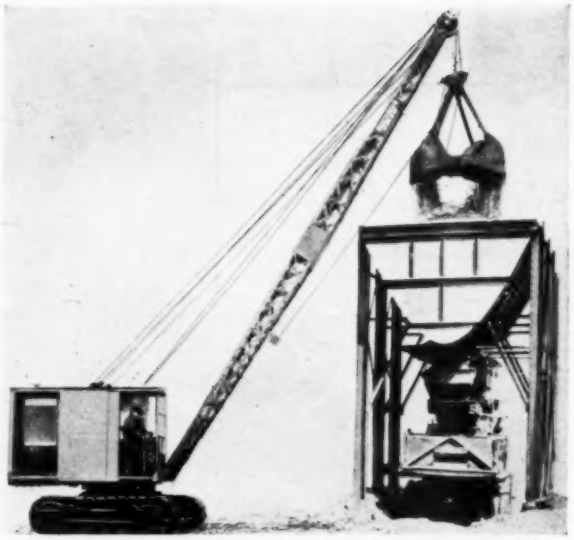
At one side of the excavation an electric powered mortar mixer was placed, which dumped into a bucket lifted and lowered by the Novo "NH" hoist. Brick was piled on the other side of the excavation; the brick was also lowered by the hoist down the shaft. Approximately 200 brick constituted a load, which, as in the case of the spoil, weighed 1,500 pounds, including the bucket.

The Novo "NH" Hoist

A New ¾-Yard Shovel and Crane

FASTER swing and faster hoisting power are claimed for the new 72½-horsepower motor of a new gas shovel and crane of the Bucyrus-Erie Co., South Milwaukee, Wis. This Type "1030" is rated, according to the manufacturer, as having about 30 per cent more power than that provided on the previous models of this size.

The powerful motor permits the use of larger hoist drums, higher line speeds for faster closing and hoisting of a ¾-yard clamshell and faster overhauling of a ¾-yard dragline bucket. Oversize contracting-band clutches are used, to take care of the greater speed, with a large brake of the contracting shoe type to stop the swing. This allows the operator to swing faster without any fear of overheating and rapid wear on the clutch bands, since "plugging" of the swing is not necessarry to stop. This separate brake also adds to the life of the swing clutch. Large outside band clutches that are simple and easily accessible, are used in this machine.



The Bucyrus-Erie New ¾-Yard Shovel and Crane

To prevent any chance of the swing gears working apart and springing the shafts, the gears are tied together and held in positive alignment by a steel box housing. The gears are completely enclosed, running in oil.

The drum shaft, which is 5½ inches in diameter, looks more like an axle than a shaft. The swing clutch shaft is 3⅝ inches in diameter.

The truck frame is a one-piece steel casting. The revolving turntable is of the same one-piece cast steel construction, providing a rigid base for the operating machinery, cutting down vibration to the minimum, and keeping the machinery in permanent alignment.

The use of anti-friction type ball bearings assures smooth operation, since every running shaft above deck which operates while the machine is digging, is equipped with self-aligning ball bearings, designed with a high factor of safety, and assuring efficient power transmission. Perfect alignment is obtained by the use of only two bearings on each shaft.

Lubrication is simple with this machine, consisting merely of checking up on the oil level every week or so. All high speed gears and swing gears run in oil, as do the boom hoist and transmission. The driving gears of the crawler type mounting also run in oil.

Operation is easy for running at high speed. The control levers are easy to handle, operating at a touch, with auxiliary clutches setting the large clutches entirely by power. The weight of the machinery is placed entirely to the rear of the center pin, giving the crane an extra margin of counterbalance for heavy lifting, and as a shovel, more stability in hard digging.

The "1030" has the single shaft drive, crawler type mounting. The mounting has a Bucyrus-Erie 2-way brake, which quickly locks the machine in either direction, while permitting free travel the other way. Any part of the mounting can be taken out without removing any other part.

If executives in the construction industry would study all of their firms' reports, and determine the causes, and study the trend and costs indicated thereby, it is certain that accident prevention would be begun and almost immediate improvements in accident frequency and severity be secured.

WATER SUPPLY . . . . FIRE PROTECTION . . . . SEWAGE DISPOSAL

No hot lead: no cold lead:
no pouring: no calking . . .

LABOR-SAVING simplicity and unfailing dependability are the outstanding characteristics of Universal Cast Iron Pipe. All jointing materials eliminated. Nothing to deteriorate—nothing to work loose in these *flexible* machined iron-to-iron joints.

Laid practically anywhere in any season. Curves laid with straight lengths. Easier. Quicker. Safer. *Wrenches the only tools.*

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Above view:—Two 12-inch Universal Pipe Lines—River Crossing

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No bell holes to dig: No joints to calk

THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

Graybar Building, 420 Lexington Avenue

New York

Two New Clay Diggers

TWO new clay diggers have been produced by the Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, Ill., to meet the demands for speedier, lighter and more powerful tools of this type.

These new diggers are of the valveless type, the piston forming the valve, making possible a simplified construction and doing away with non-essential parts. Freezing has been eliminated because of the arrangement of the exhaust ports. Vibration has been minimized, resulting in ease of handling, especially in overhead work.

The Pneumatic Clay Digger

The No. 201 Thor digger has a speed of 2800 blows per minute. This high speed makes it adaptable for trimming, soft clay digging and overhead work in trunels. The stroke is 1½ inches and the bore is 1 9/16 inches. The weight complete with retainer and spade is 24¾ pounds, and the length over all, including spade, is 31¼ inches.

The No. 202, because of its power, is especially suited for hard digging in hard pan, caisson wells, tunnels and open trench work or wherever an extremely hard blow is required. It has a speed of 2200 blows per minute. The stroke is 2 inches and the bore is 1 9/16 inches. The weight complete with retainer and spade is 25¾ pounds, and the length over all, including spade, is 32½ inches

Excavators will find this a most valuable tool because of its speed, light weight, and power.

New Paint Spray Equipment

A NEW paint spray gun, Type EF, with two important additions, has been developed by The Alexander Milburn Co., 1416-1428 W. Baltimore Street, Baltimore, Md. These features are: first, a dialed head which gives numerous different spray adjustments from a circular spray to a fan, permitting the operator to obtain any desired spray instantly without first making tests, and second, a series of indicator numerals on the paint valve plunger. A pointer is operated as the operator turns the adjustment button. Just as the dial in the head produces the exact spray wanted, so the indicator numerals on the paint valve plunger provide the exact volume desired without the necessity of losing time by testing. The operator, having found that a certain class of work is best performed when the indicator points to a certain figure, makes the proper adjustment before beginning to spray.

The new dialed air control valve and the plunger of the new Type EF spray gun have been made interchangeable with the Type E gun of this company.

The Milburn Type EF Paint Spray Gun

A New Model Dragline

A MORE durable, easier running and easier operated dragline, No. 60, has been developed by the Russell Grader Manufacturing Co., Minneapolis, Minn. It is offered with the Waukesha 60-horsepower motor, and is distinguished by several new features.

A solid welded all steel frame permits accurate machining and fitting of all journal brackets, making alignment easier. The shafts are mounted in Timken bearings on the operator's end, and these take all end thrust both ways from the clutches. Hyatt bearings are used on the gear end of the shafts.

The Russell Grader New Dragline, Model No. 60

Malleable friction blocks are lined with "Hico" asbestos brake lining, and may be removed or replaced without taking the assembly apart. The removal of a collar permits the drums to be shoved over to remove the friction blocks. The friction clutches are engaged or disengaged by very slight pressure on the clutch lever that controls a thrust screw. These thrust screws are of large size, mounted in removable bronze nuts and a Timken bearing is interposed between the end of the screw and the thrust pin.

The machined cut gears have a 4-inch face. The silent drive chain from the motor to the drive shaft is enclosed. Bronze bushings are used in both drums.

A Caterpillar Thirty with Baker-Maney Scrapers Grading and Filling on a Sub-Division Near Knoxville, Tenn. W. D. Kirby, Contractor, Knoxville.

80% of all CHLORINATORS in the World are W & T *Solution Feed*

W & T VACUUM SOLUTION FEED CHLORINATOR TYPE MSV

The vacuum principle of control is exclusive with W & T Chlorinators. The operation is completely visible. Chlorine comes in contact only with silver, glass and rubber. The first Vacuum Chlorinator was shipped in 1921. It is still operating and so are all of the other two thousand shipped since then. Long life is characteristic of W & T equipment.

Go to far off Mesopotamia — to frigid Finland — to the torrid Gold Coast.

Go to throbbing India — to troubled China — to thriving Japan.

Go to almost any community in North America — and to the leading communities of South America — and there on Water Supply or in Industry — on Swimming Pool or at Sewage Works you will find a W & T *Solution Feed* Chlorinator, guarding the public health — destroying the microbes of disease — making drinking water safe to drink!

W & T *Solution Feed* Chlorinators are best because they are longer lived — more flexible in operation — easier to clean — dependable — accurate. Real man-sized chlorinators built to give satisfactory service indefinitely. *Solution Feed* Chlorinators are most reliable — the finest public health insurance.

And back of the thousands of W & T Chlorinators stands the largest Public Health Engineering Organization in the world — an organization with trained personnel and supplies operating from forty strategic locations.

Let us tell you more about W & T *Solution Feed* Chlorinators.

W & T SOLUTION FEED CHLORINATOR TYPE MSP

Younger brother to the MSV — introduced in July 1926. Not one of the thousand shipped since have failed to give complete satisfaction. Send for technical publication No. 74.

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SA 13

The Crowe Safety Saw, Type CC-16

A Portable Electric Saw

A NEW portable electric saw known as the Crowe Safety Saw CC-16 has been brought out by The Crowe Manufacturing Corp., 317 Sycamore Street, Cincinnati, Ohio. At a recent demonstration, one man with the CC-16 cut through 14- x 6-inch oak in 20 seconds. The manufacturers claim that one man with this saw will do twenty-five times as much work as two men with a cross-cut saw. The saw is easily operated and carried by one man. Speed, simplicity and safety are its three distinct features.

The simplicity of operation of the saw makes it fool-proof. No training is necessary for its successful use. The saw is carried to the lumber, plugged into an ordinary light socket, and is ready for action. After making the chalk line, the front guide is rested flatly on the material to be cut before the motor is started. Then the saw blade is fed into the lumber, always keeping the finger on the trigger. After the cut is completed, the trigger is released, stopping the motor, and the safety guard automatically returns and locks in a safe position.

The body of the tool is of aluminum alloy, making it light in weight and easily handled. It derives its power from an especially designed General Electric motor. The blades are of specially treated steel, and retain their cutting edge even when filed down almost to the revolving hub. Special blades are provided for cutting soapstone, bakelite, copper, cable, wallboard, marble, limestone and other resistant materials.

The Safety Saw CC-16 fan and shafts are mechanically and dynamically balanced in order to eliminate vibration. The saw is equipped throughout with heavy-duty ball bearings. It has been approved for safety by the Underwriters' Laboratories, the State Industrial Commission of Ohio, the Department of Labor of the State of New York, the Department of Labor and Industry of the State of Pennsylvania, and other safety committees. This manufacturer also makes a full line of saws which will cut up to 6⅛ inches deep, including an air-driven saw of similar construction to the CC-16, for use where no electricity is available.

Pile Driver Hammer Built of Quick Hardening Cement

A NEW hammer was built to replace a broken one which made a pile driver useless, recently, by using a quick-hardening cement, reinforced. The job was in Republic County, Kans., and the constant use of the pile driver in its road building and repair work caused it to break in the midst of the job. The Resident Engineer, Amos Peterson, conceived the idea of replacing the hammer with one made of concrete. In order that the equipment might be available for use as quickly as possible, Quikard cement, a product of the Ash Grove Lime & Portland Cement Co., Kansas City, Mo., was used in a 1:2½ mixture and reinforced.

The new hammer, weighing one ton, was completed in a short time and was in active service twenty-four hours later. By dropping this hammer 15 feet a driving weight of 15½ tons was obtained.

This cement is a highly-refined, super-strong portland cement, that obtains standard 28-day strength in 24 hours with increased strength thereafter. It fulfills all the standard specifications for portland cement, exceeding the strength requirements. It has a normal, initial and final set, and is a uniform, light steel gray color. It is unusually plastic, easy to work and finish, and waterproof.

Quikard cement binds with old or new portland cement concrete. It is mixed and placed like portland cement and requires curing for only twenty-four hours. Any experienced concrete worker can use it successfully. It is especially useful where time is an essential factor, since three to four weeks time can be saved in any type of concrete construction.

A New Single Shot Blasting Unit

THE danger of misfires or delayed fires from fuse troubles in individual blasting is done away with by the shot firing unit introduced recently by the National Carbon Co., Long Island City, New York, with the approval of the United States Bureau of Mines. This Eveready shot firing unit No. 2696 is now available for use not only in mining, but for all conditions where blasts are fired one at a time, on the surface, in quarries, in stump blasting, etc.

The New Eveready Single Shot Firing Unit for Blasting

Drawing its current from a dry battery cell, contained in its compact light weight cylinder, this product brings the advantage of electric firing to every blaster. The unit is patterned after the popular tubular flashlights produced by the same company, and has the appearance of a flashlight even to the convenient ring hanger on the bottom cap for hanging on one's belt or a nail or hook on the wall. The ring hanger when not in use snaps over the bottom cap, out of the way. The unit contains three standard flashlight batteries, as unit cells, during the life of which hundreds of shots can be fired.

Wires leading from the cap are fastened to a special plug. To fire the blast it is necessary to insert this plug in a small socket in the end of the device and hold it there with pressure against a spring inside. As soon as one's hand is released the plug is disconnected, as the spring forces it out of contact.

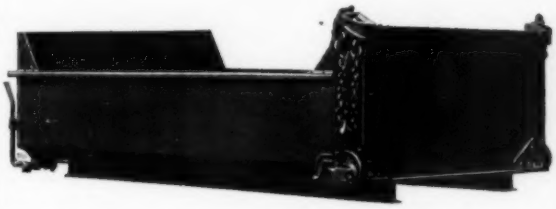
Under the United States Bureau of Mines' regulations, the unit cells are sealed in place by the user after he has inserted the cells in the shot firing unit, which is shipped empty.

A piece of wire is run through the three holes in the end of the tube. The end of the wire is connected with an electric cap which is inserted in a cartridge at the blasting point. The other end of the wire is connected with a plug, which is pushed in the hole at the end of the firing unit to make the proper contact and fire the blast.

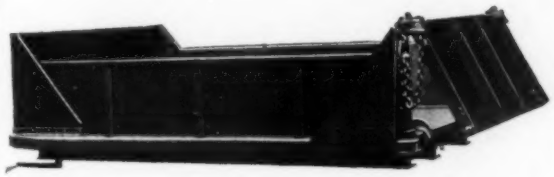
Wood Steel Dump Bodies

The bodies shown are the most popular types of our complete line. We build special bodies for special requirements.

W-12 is a heavy-duty body for excavation work and severe service.



W-8 is a very popular rugged type of general dumping requirements.



H-1 has removable sides and is quickly convertible into platform body for general purposes—practically two bodies in one.

WOOD HOISTS-BODIES

Wood SERVICE on Hoists and Bodies is World-Wide

Wood Hydraulic Hoist & Body Co.
Detroit, U. S. A.

Jaeger Heavy Duty 10 S Holds 2 Bags

1-2-5

Built of Steel · Lighter · · 50% Stronger

"Fastest Mixer I've Ever Owned," say Contractors

FASTER charging with big drum openings and Automatic Skip Shaker (no pounding); faster mixing, re-mixing drum action; faster discharge (8 to 11 seconds) and one man control throughout.

MORE PORTABLE than many a 7S. It's all-steel, 50% stronger, ½ ton lighter; short coupled and direct driven; roller bearing wheels, dual tires (half steel, half rubber) carry it over soft ground or paved street.

SMOOTHER running in all parts. Drum tracks of machined steel run on chilled ground faced rollers; direct steel gear drive operates in oil bath. ball bearings on reduction shafts and drum rollers save 19% of power, eliminate breakdowns.

AUTOMATIC SKIP SHAKER

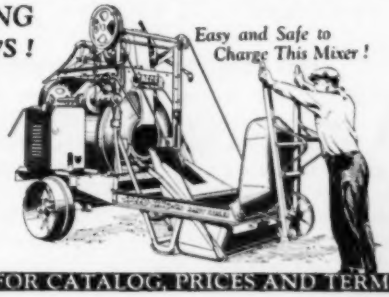
Stops that man from pounding loader out of shape.

100% BALL BEARING

OTHER ADVANTAGES include Jaeger Accurate Measure Water Tank, renewable liner on discharge spoon. Prompt service anywhere from over 100 Jaeger Service Stations.

SPEED KING that Handy 7S !

Get our prices on this record breaking all-purpose trailer; also heavy duty sizes up to 28 ft. Tilters with loaders up to 14 ft. sizes.



Easy and Safe to Charge This Mixer !

MAIL THIS FOR CATALOG, PRICES AND TERMS!

The Jaeger Machine Co. Date_____
701 Dublin Avenue, Columbus, Ohio

☐ NON-TILT MIXERS ☐ TILTERS ☐ PLASTER MORTAR MIXERS (Check where desired)

Name_____

Address_____

City_____ State_____

The Atlas 4-wheel Drive, 4-wheel Steer Tractor

A 4-Wheel Drive, 4-Wheel Steer Tractor

FOUR predominating factors of the 4-wheel drive and 4-wheel steer tractor of the Atlas Engineering Co., Clintonville, Wis., make this unit particularly adaptable for construction work. These are power, operating costs, simplicity and ability to perform under adverse conditions.

Power is derived by applying the drive 15 inches from the center of the axle, thereby taking advantage of the additional lever arm in the diameter of the wheel. With power on all four wheels, the drawbar pull is developed without carrying excessive weight.

The operating cost is diminished to a minimum because of the method of applying the power. The average fuel consumption as taken on 200 working tractors proves that 15 gallons of gasoline and 3½ quarts of oil per 10-hour day, under average conditions, is all that is necessary.

The elimination of complicated design has afforded accessibility and easy serviceability. Any breakdowns which might occur are easily taken care of because of the simplicity of all wearing parts. Parts replacements can be made in short time and without the assistance of an expert mechanic.

The Atlas has been developed to handle heavy loads in mud, water, sand, snow and on hills, across ditches and pulling stumps. The power is applied in such a positive method that at all times the traction is direct and applied from four distinct points by a push and pull method regardless of the topography of the land.

Power and flexibility are developed by the front drive and axle being pivoted, allowing for a vertical difference in elevation between the tread of the front wheels of about 20 degrees. The unit can be turned in an 11-foot radius.

Self-cleaning track shoes are standard equipment, and can be easily attached or detached from the tractor wheels. Flat rubber shoes for patrol and city work can be furnished to fit any wheel designed for the standard lug.

800 Apprentices Graduated

ABOUT 800 apprentices who have completed four-year courses under the Apprenticeship Commission of the New York Building Congress were graduated May 14, in the auditorium of the Washington Irving High School, 16th Street and Irving Place, New York. The ceremony marked the end of the fifth year of apprentice training to become journeymen conducted under joint committees set up by the New York Building Congress.

Nine trades—carpentry, painting and decorating, electrical, upholstering, bricklaying, plastering, plumbing, granite cutting and marble cutting—are cooperating in this enterprise with the Apprenticeship Commission which, in turn, works with the Board of Education and the Evening and Continuation Schools. Seventy-seven classes for learners in the building trades have been in operation during the last year. The quality of work has steadily increased and was shown in the exhibits of the various trades on display the night of the exercises.

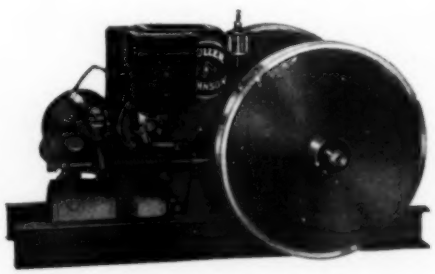
1½, 2, and 2½ H. P. Engines

MANY new features and improvements are embodied in the Model "NC" gasoline engines of the Fuller & Johnson Manufacturing Co., Madison, Wis. Among the most recent of such features are the solid disc fly wheels which not only add to the general appearance of the engine but which also increase its smooth running qualities and, with the gib key shroud, promote safety for the operator.

The 1½-, 2-, and 2½-horsepower sizes are designed to receive steel channel iron skids which can be easily drilled to receive suitable holding bolts. The height of the engine may be varied, using either 3-, 4- or 5-inch channels which are available in practically any length desired and may be attached with the angles facing in or out. This permits a variety of mountings and is made possible because of the fuel tank being attached directly to the cylinder casting where it is securely held by means of a 2-inch steel adjustable girt or strap which encircles the circumference of the tank. As a means of strengthening, the tank is constructed with a bead rolled into that part of the tank gripped by the strap. The tank being cylindrical in shape, a small amount of fuel will suffice to continue operation of the motor.

The gasoline filler pipe is at such an angle that the operator can easily insert a measuring rod. The pipe has a threaded cover which prevents loss of gasoline due to tilting or jarring the engine when mounted on a portable machine. The pipe is of sufficient size so that the tank can be filled without the use of a funnel. The fuel can be poured in as fast as the operator desires, because of an air vent with which the fuel tank is provided.

For the convenience of the operator the throttle is arranged so that it is easily accessible. The water drain has been placed on the operating side of the engine. The vaporizer opening is from the bottom of the elbow.



The New Model "NC" Fuller & Johnson Gas Engines

Construction on Schedule

IN a recent issue of "The Skyscraper" published by Thompson-Starrett Co., New York, the following statement appears: "Over a week-end on a date which was established a year ago, the Equitable Trust Co. of New York moved (without any interruption of its service) into the first eleven floors of its new 42-story building at Broad Street and Exchange Place."

Such a statement sounds simple, but over a period of one year think of the infinitely careful attention to detail which insured delivery of materials, equipment, allowances for delays caused by strikes, floods and other agencies over which the contractor had no control, and one will appreciate the value of a promise made and a promise kept. In the construction industry a promise kept is something more than a contract fulfilled. It is only the carefully planned job handled by a painstaking contractor that is finished on time.

A typical application of the "Wolf" Portable Timber Sawing Machine by Edward E. Gillen Company, Milwaukee. Machine in this case is the air driven type with model "A" Ingersoll-Rand motor; capacity 24-in. diameter timber, weight 95 pounds.

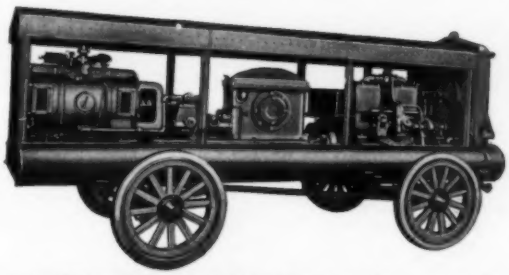
Successfully serving the railroad, mining, marine, general construction fields, etc. (Names on request.)

REED-PRENTICE CORP.

Worcester, Mass.

N. Y. Office: 1508 Evening Post Bldg., 75 West St.

THE RIGHT COMPRESSOR FOR ALL KINDS OF PNEUMATIC TOOL WORK



READY FOR EVERY JOB---

HORIZONTAL TYPE—DOUBLE ACTING—SLOW SPEED—STURDY AND RELIABLE—LONG LIFE—LOW UPKEEP.

THE TRAYLOR 12 in. x 10 in. PORTABLE COMPRESSOR

Will operate five rock drills, fourteen chipping hammers, or other pneumatic tools in proportion

Send the Coupon—Now!

Also write us for information on the "Cement-Gun" and "Gunite."

CEMENT-GUN COMPANY, Inc.

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Cement-Gun Co., Inc. Date.....
Allentown, Pa.

Please send full information on the TRAYLOR PORTABLE COMPRESSOR. ☐

I would like to have your representative call. ☐

Name .....

Address .....

City .....State.....

The New Trackson McCormick-Deering Tractor

Crawlers Convert Tractor Into 3½-Ton Unit

COMBINING Trackson performance with International strength and reliability, The Trackson Co., 519 Clinton Street, Milwaukee, Wis., has announced that it is manufacturing Trackson Full-Crawlers for the McCormick-Deering tractor. The 10-20 tractor provides a power plant that has ruggedness of construction, simplicity of design, and a reserve of power. The Trackson gears this power to the ground, increases the tractor's flexibility, adds weight for bearing down, makes shorter turning radius possible, and gets traction in any ground conditions.

One of the outstanding features of this crawler-tractor is its practicability for use with other equipment. The Trackson is constructed on simple lines, leaving the frame unobstructed and with plenty of clearance between the crawler and the tractor so that this equipment can easily be mounted and actually built in, instead of merely hanging it on.

Good balance has been obtained in this new combination, enabling the outfit to hug the ground and secure complete traction. The weight of the unit complete is 7,200 pounds. The length over-all with swinging drawbar is 118 inches, the width 72 inches, the height 64 inches, and the center to center of tracks is 60 inches. The ground clearance at the lowest point is 9 inches. The ground pressure is less than 4½ pounds per square inch.

The tracks are of heat-treated electric alloy steel castings 12 inches wide, self-aligning on sprockets and of non-clogging design. The corrugated ground-gripping tread will not cut or mar streets, roads or pavements. Manganese steel tracks can be supplied for use in gritty, cutting, or abrasive soils, and special alloy steel tracks equipped with rubber pads can be supplied where the tractor is to be used on smooth, hard surfaces which would give little or no traction to the standard corrugated tracks.

The front sprockets are heat-treated electric alloy steel castings of great strength, and the rear sprockets are high grade electric steel hubs with manganese steel rims. The truck frames are heavy pressed steel with re-inforcing angles and steel castings riveted in place. The spacing axle is heat-treated, of alloy steel. The dirt-proof, ring-oiling bearings with large steel truck wheels are fitted on tapered ends of hardened and ground alloy steel shafts.

The brakes, controlled through a regular steering hand-wheel, have heavy-duty, hydraulic compressed, copper-inserted, asbestos brake linings. Special grip nuts or fastenings are used on every bolt connection to prevent loosening. Grouters can be supplied for the track shoes where it is necessary to work in mud, deep sand, snow, or loose, soft ground. A power take-off can be used without any interference with the crawler.

A Self-Propelling Air Compressor

A SELF-PROPELLING 4-wheel unit, combining either the Fordson or McCormick-Deering 10-20 tractors and the Quincy Model W-4 Duplex single-stage compressor, has been developed by the Pontiac Tractor Co., 44 West Lawrence Street, Pontiac, Mich.

The compressor is a 124-cubic-foot displacement machine, having a separate radiator for the compressor with pump-driven circulation, a force-feed oil system, a 3-bearing crankshaft, a Penn unloader, and a large air receiver. The unit is so mounted on a frame that it can be attached to any of the above tractors in the field in an hour's time, making a unit capable of hauling other equipment behind it, while doing the compressor's duty on the job. Instead of requiring another truck or tractor to transport the machine to the job, the drawbar is left free so that it can haul other equipment.

The unit is driven with a clutch pulley on the tractor, and has the belt always in line. It has a separate radiator set so that the fan on the Fordson tractor draws a portion of the air through it before passing through the Fordson radiator. The manufacturers claim that this keeps the temperature 60 to 70 degrees lower than on machines cooling from engine radiator, thus adding to the efficiency of the machine.

There is ample room on the extension frame in front of the compressor to carry an air hoist or large tool box for tools and equipment. The compressor is regularly equipped with four openings but can be furnished with any number required. It develops a speed of 700 r.p.m., has 100 pounds maximum pressure, 6¼-inch bore, 5-inch stroke, and W & K spoked-type rubber wheels.

The Self-Propelling Pontiac Air Compressor

$60,000,000 Suspension Bridge Planned

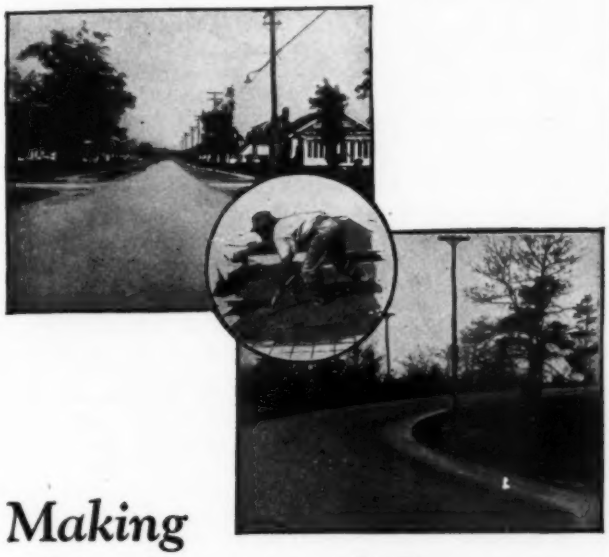
PLANS have been announced for the construction of the longest single span bridge in the world to cost $60,000,000 and to be supported by toll. On May 1, 1928, the Interborough Bridge Co. composed of Brooklyn and Staten Island, N. Y., business men, placed before the War Department plans for a suspension bridge having a clear span of 4500 feet averaging 235 feet above high water. The towers on either side would rise 600 feet in the air. The bridge would be 1000 feet longer than the 178th Street Bridge across the Hudson River now under construction.

It is planned to rest the eastern tower of the bridge on an island now occupied by the disused Fort Lafayette, 200 yards from the Brooklyn shore. The other tower would be set inside the pier headlines on the Staten Island shore, thus offering no hazard to navigation. With a clearance of 235 feet the bridge floor would tower far above the masts of the greatest vessels now afloat. It would be 100 feet higher than the Brooklyn, Manhattan or Queensboro bridges which now offer no obstacles to navigation.

American Steel & Wire *Company's*

WIRE FABRIC

"The Steel Backbone for Concrete"



Making City Street and Country Highway Permanent

TO reinforce concrete roads with Wire Fabric makes them permanent and is a proven economy. This fact is conclusively brought out in the report of the Highway Research Board, National Research Council.

Made of cold drawn high tensile strength steel, Wire Fabric has proved itself the perfect slab reinforcement. It gives the most effective distribution of steel—the closely spaced wires insuring greatest binding strength, holding the slab together as a solid unit and preventing the development of cracks.

Wire Fabric means permanent reinforcement—longer concrete life—lower maintenance costs. It is furnished in sheets cut to definite size which are easily handled and placed.

SALES OFFICES:

CHICAGO	208 So. La Salle Street	NEW YORK	30 Church Street
CLEVELAND	Rockefeller Building	BOSTON	Statler Bldg
DETROIT	Foot of First Street	PITTSBURGH	Frick Building
CINCINNATI	Union Trust Building	PHILADELPHIA	Widener Building
MINNEAPOLIS—ST. PAUL	Merchants Nat'l Bank Bldg., St. Paul	ATLANTA	101 Marietta Street
		WORCESTER	94 Grove Street
ST. LOUIS	506 Olive Street	BALTIMORE	32 So. Charles Street
KANSAS CITY	417 Grand Avenue	BUFFALO	670 Ellicott Street
OKLAHOMA CITY	First Nat'l Bank Bldg.	WILKES-BARRE	Miners Bank Bldg.
BIRMINGHAM	Brown-Marx Bldg.	*SAN FRANCISCO	Russ Bldg.
MEMPHIS	Union and Planters Bank Bldg.	*LOS ANGELES	2087 E. Slauson Ave.
DALLAS	Praetorian Building	*PORTLAND	777 Nicolai Street
DENVER	First National Bank Bldg.	*SEATTLE	4th Ave. So. & Conn. St.
SALT LAKE CITY	Walker Bank Bldg.		

*United States Steel Products Company.

When your job is miles away from water!

Barnes Triplex Road pumps fully demonstrate their value when the job is miles away from water.

Built for high working pressures, they deliver an unfailing supply of water for all operations over extremely long distances irrespective of high elevations.

The features below show why "break-downs" so frequent with many pumps do not occur when Barnes are used.

1—Most simple, self-oiling system—one-moving-part rotary pump
2—All-steel gears
3—Forged crankshaft—not cast
4—Three-point suspension truck, spring-mounted
5—Roller bearings on all shafts, including crankshaft
6—Water cylinders detachable from power end
7—Flexible coupling between pump and engine
8—Rubber-tired roller-bearing wheels, interchangeable with standard steel wheels

Capacity 80-100-125-150 gallons per minute. Pressures up to 500 pounds

THE BARNES MANUFACTURING CO.

905 Main St., Mansfield, Ohio

BARNES PUMPS

Mail This Coupon for Complete Specifications

The Barnes Manufacturing Co.,
905 Main St., Mansfield, Ohio

Please send me further information about Barnes Water Supply Pumps.

Name .....

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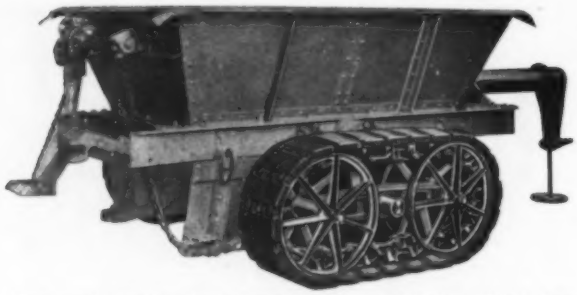


Five-yard Euclid Trailer with Creeper Wheels, Which Can Be Handled Readily in Trains

Track Laying Wheels for Heavy Hauling

A NEW type wheel for hauling heavy loads over bad roads or where there are no roads has been produced by The Creeper Wheel Co., Reading, Pa. This Creeper wheel is of the track laying type, built to creep over the top of mire and mud, hills and hollows without digging in. Since this wheel lays its own track as it moves along, it is not dependent on roads. After the creeper wheels have passed over the earth several times a road is formed.

Electric alloy heat-treated steel is used in the production of the creeper wheels. The wheels are flexible and can be moved by a push of the hand, this flexibility being due to the simplicity of design and construction in the track and the use of roller bearings. There is a minimum of wearing parts, no intermediate rollers or other supporting members being used. The wheels are non-friction and non-clogging, making it possible to carry extremely heavy loads with a saving in tractor power and, as the wheels cleanse themselves of mud with each revolution, they carry no excess weight.

Creeper wheels are manufactured in capacities of 4, 6, 10 and 15 tons. The 15-ton heavy-duty unit has been especially designed and built for rugged wear.

The wheels, in laying their rigid belt of steel, roll over mud, sand, stones, stumps, ditches and other obstruction easily, as the mechanical construction is such as to allow each rigid belt to work independently of the others in meeting whatever obstruction there may be in its path.

The principal of these wheels is that of laying the rigid belt of steel between two pairs of track wheels. The rigid belt is constructed of tension members, forged from a solid block of open hearth steel, especially heat treated to insure both strength and wear. The pressure system of lubrication is used.

A Portable Screening and Loading Plant

A COMPLETE portable screening and loading plant has been made possible by the manufacture of a rigid self-supporting conveyor and a substantially built shaker screen of the Northern Conveyor & Manufacturing Co., Janesville, Wis. The King conveyor of this company is especially suited for this work and can be moved from one location to the next on an instant's notice, as the unit is easily erected, the screen being supported only by the conveyor frame.

The frame of the King is of the all steel construction, trussed, laced type, insuring rigidity with the lowest possible weight. Two styles of hopper are regularly furnished, the first 14 inches high, and the second 7 inches high. Roller bearing screw-type belt take-ups are provided at both head and tail ends, thus permitting the proper alignment of the conveyor belt under all conditions and allowing the taking up of all average stretch in the conveyor belt without the necessity of cutting a piece out of the belt.

Either a gasoline engine or electric motor is furnished, and is regularly mounted on a platform above the conveyor where it is accessible and free from dust or foreign material.

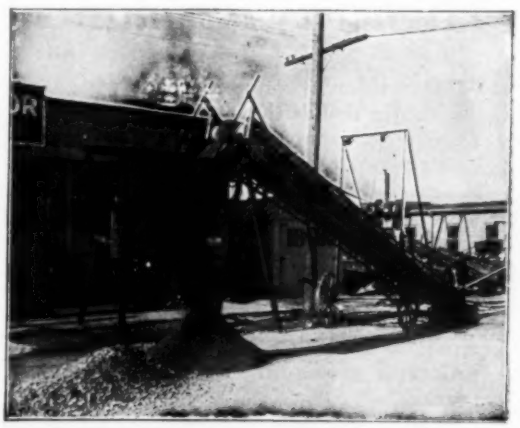
A standard overhead type of truck, with either straight or swivel axle, is recommended for this unit. This style of portable truck permits elevating the conveyor to any desired angle, and moving when elevated or lowered.

The capacities of the conveyor vary from 75 to 250 tons per hour, depending on the speed of the belt and the kind of material being handled. This model is regularly furnished in all lengths from 16 feet to 100 feet.

The spacing of the troughing rollers is regularly 12 inches O. C. under the loading end, and 20 inches beyond this. This close spacing supports the belt at all points, relieves the belt of strain and tension by transmitting the load evenly to the frame and by providing a rolling surface for the belt for its full length, reduces power consumption.

The conveyor belt is 4-ply, 24 inches wide, made of 28-ounce duck and ordinarily equipped with cleats. An overlapping steel guard extending beyond the edges of the conveyor belt on each side and directly under the top belt diverts possible falling material from the main belt on to the return belt. A rubber-faced scraper that rides the return belt and cleans it thoroughly is placed inside the loading end for the purpose of preventing possible damage to the conveyor belt. Lubrication is through Alemite fittings placed at all necessary points.

The steel sides extending the full length of the conveyor on each side are regularly built in and fitted with the conveyor frame. The troughing rollers are set into these sides and the shape of them is such as to meet and follow the concave shape of the conveyor belt. An over-lapping protecting belt is bolted at close intervals on to these sides and the combination of the sides and the belt permits the loading of the conveyor to its full belt width and an unusual depth, at the same time keeping all materials on the belt.



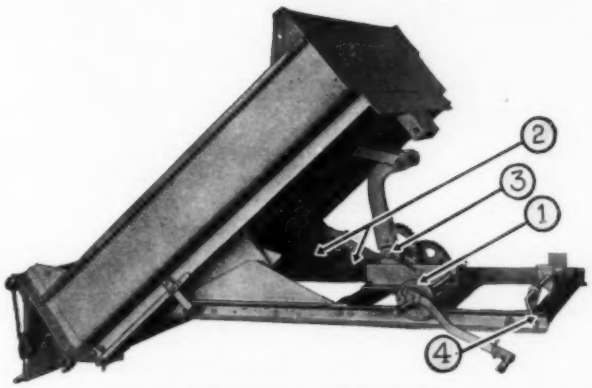
Thirty-foot King Conveyor Operating with Double Deck Shaker Screen Attached

Certified Checks Required

THE State of Pennsylvania has taken action that after May 24, 1928, all bids received must be accompanied by a certified check in the amount called for, bids not so accompanied will be rejected.

The certified check submitted must be a check drawn by the depositor on funds deposited, and properly certified by the bank of deposit. Bank treasurers' checks, bank cashiers' checks, certificates of deposit, or any other form of proposal guaranty, will not be accepted.

At Last, The Easiest, Quickest Acting Hand Hoist Dump Body For Every Vocation



(1) The new automatic roller lock positively holds the body in control at any angle, both in dumping the load and in returning the body to road position. This is a new appliance covered by our patents. It eliminates ratchets, dogs and brakes which apply directly to the crank shaft.
(2) The new roller and track mechanism permits the easiest and quickest dumping action possible.
(3) The simple, heavy, durable hoist is geared so that the load can be dumped in 4 turns of the crank handle.
(4) A positive locking device is provided, thus holding the body securely in road position. It also permits a 3-point suspension.

EVERY BODY IS GUARANTEED FOR ONE YEAR

The GALION ALLSTEEL BODY CO., Box 15 Galion, Ohio

Announcing *The New Republic Roller Bearing Line*

Utmost in Quality

At Lowest Price

Points of Superiority

(1) Hyatt Roller Bearing Construction Throughout
(2) Bigger Drums
(3) Thicker Heads
(4) Heavier Trucks
(5) Higher and Wider Wheels
(6) Simpler Construction
(7) Heat treated steel Cut Gears running in Oil
(8) Short turn trucks
(9) Countershaft Eliminated
(10) Chain operated Skip-shaft
(11) Automatic throwout and brake

A Complete Line

Tilters and non-tilters of 3½-5-7-10 cubic feet capacity. You will want complete information. Write today for latest catalog and prices.

REPUBLIC IRON WORKS
Tecumseh, Mich.

Send me Catalog and Prices on Mixer of ..... feet capacity.
Name .....
Address .....

A New Bulldozer for 2-Ton Tractors

A STEEL bulldozer with a blade 6 feet long by 10 inches wide has been developed by the Miami Trailer-Scraper Co., Troy, Ohio, for use with the 2-ton Caterpillar tractor. The bulldozer blade is so mounted on the push arms that it can be tilted forward or backward at the top to provide proper suction.

The Miami bulldozer is power operated from a power winch mounted on the rear of the tractor. The positive control of the blade through the winch enables the driver to raise or lower the blade instantly without stopping the tractor.

This bulldozer is strictly a one-man outfit, the entire unit being operated and controlled by the tractor driver, thus eliminating the several men and teams, while the speed of operation is stated as effecting considerable saving of time.

Among the uses for this bulldozer are trench and pipe line backfilling, leveling off dumping grounds, grading roads and streets, pushing dirt over fills, filling in around bridges and foundations, and for moving snow. It is stated that this unit can backfill a trench 3 feet wide by 6 feet deep at the rate of 100 feet per hour, moving from 50 to 60 yards of earth.

Miami Power-Operated Bulldozer on a 2-Ton Caterpillar Tractor Pushing Dirt Over the Edge of a Fill

Curing Concrete by Asphalt Emulsion

THE curing of concrete by spraying the freshly laid material with an asphalt emulsion has been developed by the Barber Asphalt Co., Philadelphia, Pa., under the trade name "Curcrete." This method of curing concrete is positive, for if the film of asphalt left on the surface of the concrete does not appear as a continuous glossy film the spraying can be repeated upon such areas. The use of the Curcrete method is based on the theory that the concrete mixture will be made with the correct and usual amount of water that is adequate for the complete hydration of the portland cement and that the adherent continuous film of asphalt left by the Curcrete prevents the evaporation of water from the concrete mixture.

The advantages claimed for the Curcrete method by the Barber Asphalt Co. are that it tends toward acceleration of curing, but also maintains conditions suitable for additional hydration for a longer period of time; it leaves a pleasing darkened surface, effectually preventing glare on concrete highways and when desired, this can be maintained permanently by periodical reapplication of Curcrete. It is no more expensive than any other method of curing; it is stated that it results in a more uniformly cured slab of increased strength, thus preventing surface hair cracking, checking and scaling with increased resistance to surface abrasion.

Curcrete is applied immediately after finishing, the most critical and desirable time for application of any curing medium. It is applied in a single operation, and requires no attention after the initial application, and no preliminary covering such as wet burlap. No water cost for curing is entailed, nor the maintenance of a water line during the curing period, nor a clean-up at the end. There is no possibility of failure to wet the hay, straw, earth or other curing materials, and no fire hazards due to dry hay or straw. There is nothing to blow off the surface, and the dust nuisance which often prevails when other curing methods are used, is eliminated. It will not clog drains or catch-basins, and when applied properly obviates any further attention on the part of the contractor or inspector. It presents a definite contrast in color, and continuity of the film is self-evident. The manufacturers state that the Curcrete method is superior to surface applications of chemicals.

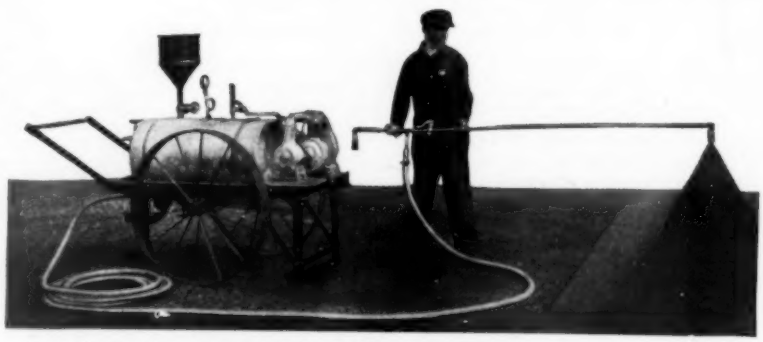
This method is the subject of several patent applications some of which have been allowed and which will be assured in the near future.

Curcrete is applied on large paving projects by a sprayer which is built by the Iroquois Works of the Barber Asphalt Co., at Buffalo, N. Y. This machine consists essentially of a 40-gallon galvanized iron tank and an air compressor unit driven by a light, single-cylinder gasoline motor, all of which are mounted on two iron wheels making the machine readily portable. The weight of the machine, unloaded, is approximately 605 pounds, length over-all 6 feet 10 inches, width over-all 3 feet 4 inches, and height over-all 4 feet 9 inches. The 40-gallon tank is equipped with valves, gage, safety valve, strainer and hose connection.

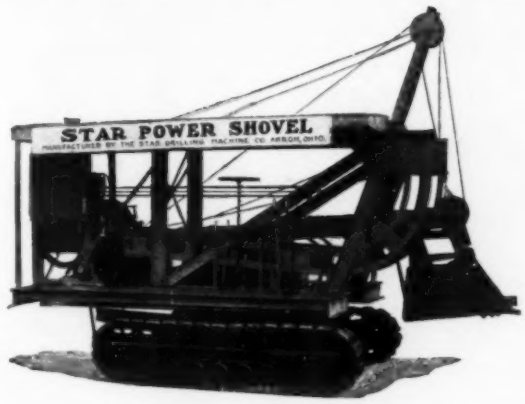
Suitable spray nozzles mounted on a length of ½-inch pipe connected to the pressure tank by means of a flexible hose 50 feet in length are used for the application of Curcrete in the form of a fine spray.

The emulsion should not be applied so lightly as to result in a light brown color after setting, nor so heavily as to cause undue tackiness. Great care must be exercised in this regard. It has been found that one gallon of Curcrete should be ample to satisfactorily coat from 5 to 7 square yards of surface.

An interesting series of illustrated articles on the methods of construction, organization and equipment of contractors operating on road jobs in Pennsylvania, Ohio, Indiana and Illinois will appear in this magazine beginning in August.



Portable Equipment for Applying Curcrete at the Rate of One Gallon to Cover 5 to 7 Square Yards



The Star Power Shovel

with

Patented Telescoping Handle

IN

Skimmer—Grader—Ditcher
Backfiller—Crane

The Star is an efficient, profitable performer on all kinds of jobs.

When equipped as a grading shovel, it has at the same time, all the skimmer shovel advantages.

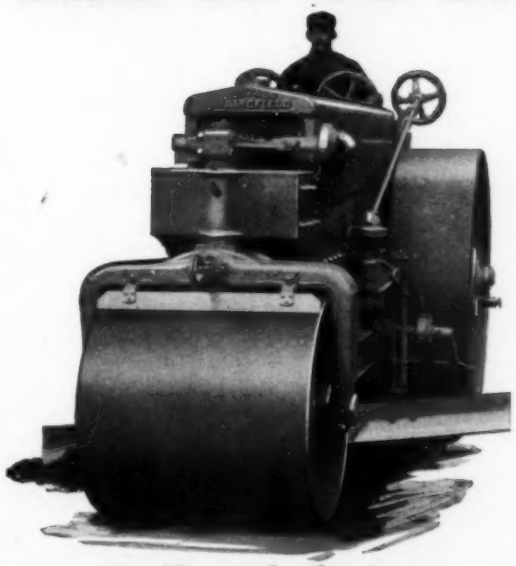
The patented Telescoping Handle permits working in very close quarters. Revolves completely in 22-foot circle. 11 feet of horizontal crowd. Teeth always in front. Full ¾-yard scoop with large overload capacity. Higher lift than any other skimmer. Full-length track wheels.

As a sub-digger or ditcher the Star, gives the advantages of the patented automatic beam-controlled bucket. Boom and bucket operated with two lines and two levers only. Drop-bottom scoop. Scoop teeth always in cutting position. Heel never drags.

The Star is a remarkable machine, deserving your careful investigation. Write for catalog and complete information.

THE STAR DRILLING MACHINE CO.
505 Washington St. **Akron, Ohio**

THE UP-TO-DATENESS OF THE BUFFALO-SPRINGFIELD



Scarifiers and other special attachments optional

accounts for the nation-wide preference of street and road builders for this particular make of equipment. That this preference actually does exist all over the country may be verified very quickly by anyone inclined to make a survey of the roller equipment in use in his particular section of the country.

Buffalo-Springfield jobs are designed to meet all sorts of conditions and are built in many models and sizes.

Illustrated literature ready to mail

The BUFFALO-SPRINGFIELD ROLLER CO., Springfield, Ohio

A New Leaning Wheel Grader

A PATROL grader with leaning wheels and telescopic rear axle has been produced by The Austin-Western Road Machinery Co., 400 No. Michigan Avenue, Chicago, Ill. This No. 22 is suitable for light grading and ditching as well as for patrol maintenance. The leaning wheels are useful in grading and ditching as well as in some of the heavier forms of road maintenance, while the telescopic axle in combination with the leaning wheels provides all round efficiency.

The wheels are regularly fitted with plain bearings, other bearings being furnished when requested. Three-inch grooved flat steel tires are furnished and rubber tires may be ordered if desired, for use on hard surfaced roads. The rear axle is of the telescopic type used on other graders of this company. Each rear wheel can be extended 11 inches from the closed position, and since the two wheels have separate controls, it is possible to work with both of them pulled in, with both fully extended, or with one pulled in and the other extended, the latter being especially useful when making second cuts.

The Western No. 22 Leaning Wheel Grader

The blade assembly and lifting mechanism are of the advanced design. The blade raising gears and worms are cut steel, while the raising rods have ball and socket connections at both ends.

Six horses can handle this grader easily, although it is sturdy enough to work behind a light tractor. Either the horse tongue or the steerable engine hitch can be furnished. With the horse hitch the No. 22 leaning wheel grader weighs 2,200 pounds, and with the engine hitch, 2,500 pounds.

"The accident problem in construction work is increasing at the present time. Employment has been increasing in the construction industries and it has been decreasing in the manufacturing industries. Fatalities have been increasing in construction work faster than employment; and they have been decreasing in manufacturing faster than employment has decreased."—James A. Hamilton, Industrial Commissioner of New York State.

The Improved Badger Double-Drum Hoist

An Improved Double-Drum Hoist

THE continuous duty requirements of road and building contractors for dragline and excavating work have been fulfilled in the improved Badger hoist of the Wisconsin Foundry & Machine Co., Madison, Wis. The assembled unit, resting on a 14-foot rigid steel frame, carries on one end the gas engine with its free engine clutch and sliding rails, while on the other end are mounted the two large drums. The belt connected unit, through a pair of gears, drives the drums in a ratio that gives the incoming line about half the speed of the outgoing line. The operator engages the lever on either of the drums with the double friction clutches attached to them and brings the load in or out as he desires; by stepping on the foot brakes the drums come to a dead stop.

The bed frames are of 12-inch channel iron 14 feet long. The gears and pinions, of heavy pitch, are accurately machined and made of semi-steel and steel respectively. The drums are of high grade cast iron. The bearings of the drums have bronze bushings pressed into place and are lubricated by the Alemite system, through two long pipes cast into the drum.

The clutch friction surface at one end of each drum is a double, cone type, friction surface being lined with a brake lining which engages similar cast iron cones lined with brake lining on the side of the large gears. This type of clutch has the power of sustaining the maximum load with minimum pressure on the lever.

The positive clutch release is attached to the drum on both the incoming and outgoing line to disengage the friction surfaces. This release consists of a clutch ring around the hub of the drum to which rings are bolted, two rods extending to a plate on the back of the thrust screw. When the operating lever attached to the thrust screw is turned back to relieve the pressure between the cones, the screw will press against the plate and force the drum to slide on the shaft away from the friction cones. The bearings are made of semi-steel iron, ample in size and lined with high grade babbitt. The unit is made in two sizes.

The engine is the Climax portable unit, mounted on slide rails for the purpose of keeping the belt tight, and to do away with the necessity of frequent lacing. The drive belt is best quality, friction surface rubber belt made endless if desired. These hoists are also built with an endless chain drive if desired.

Simple:—
Only nine parts, besides braces and bolts
Weight, with Clevis, 315 pounds

A "Super-Plow"

WIARD'S

"2 IN 1"

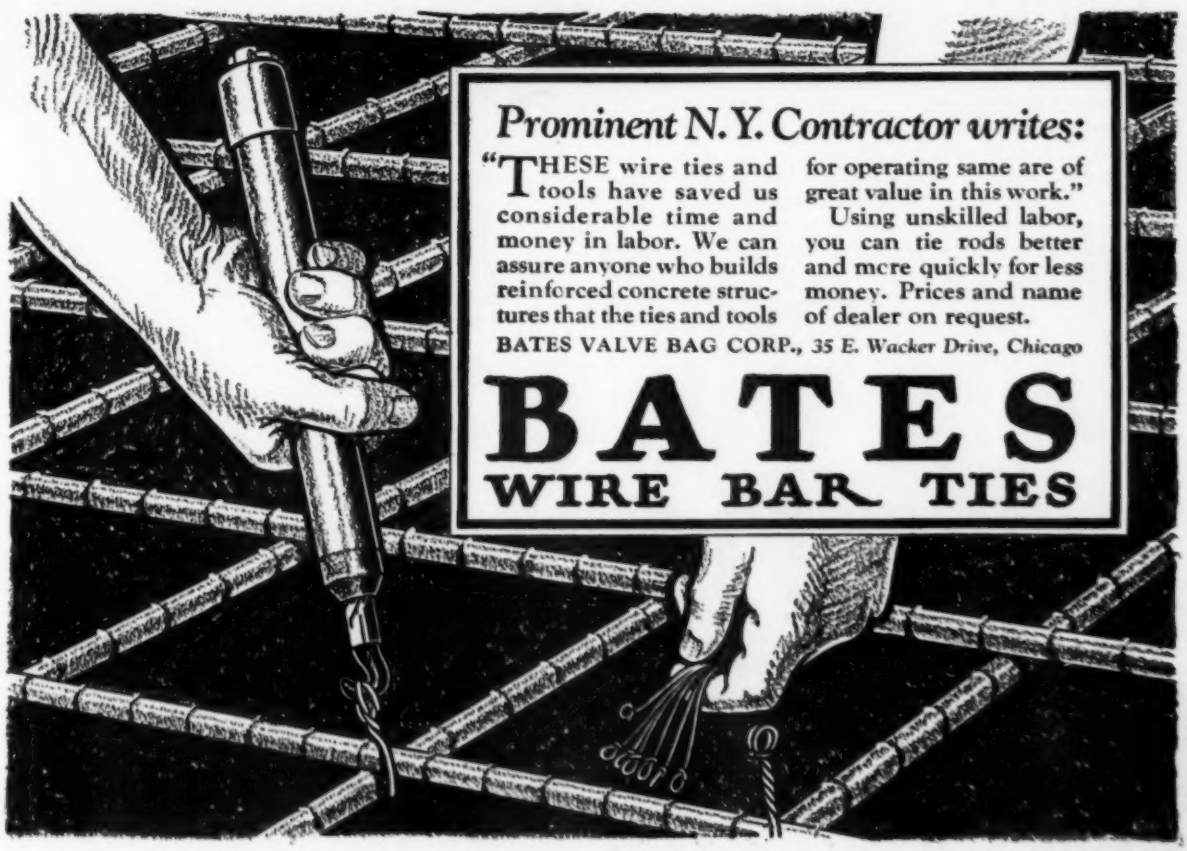
For use with:—
Animal Power
Traction Engine
Road Roller
Dragline
or
other
power

ROAD OR CONTRACTOR'S PLOW

The
WIARD PLOW COMPANY
BATAVIA, NEW YORK
Oldest Plow Makers in America

We guarantee the steel beam of this plow against breakage for one year.

For full description see our booklet



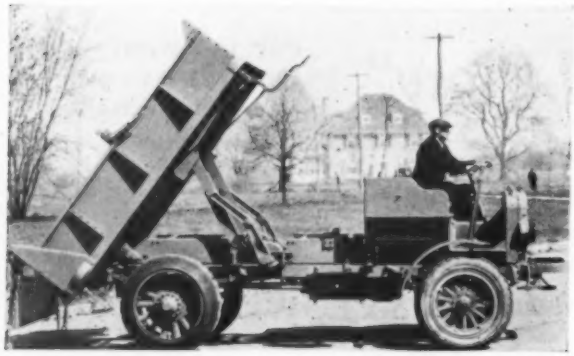
Prominent N. Y. Contractor writes:

"THESE wire ties and tools have saved us considerable time and money in labor. We can assure anyone who builds reinforced concrete structures that the ties and tools for operating same are of great value in this work."

Using unskilled labor, you can tie rods better and more quickly for less money. Prices and name of dealer on request.

BATES VALVE BAG CORP., *35 E. Wacker Drive, Chicago*

BATES
WIRE BAR TIES



New Rotary Dump Hoist with Automatic Cut-Out

A New Dump Hoist Mechanism

A NEW rotary dump hoist mechanism which will raise the truck body to an angle of 60 degrees, as compared with the 40-degree angle, has been developed by the Autocar Co., Ardmore, Pa.

The automatic cut-out is one of the outstanding features of this new unit. This cuts off the application of the power just as soon as the body reaches the maximum elevation and similarly cuts off the power when the body has returned to full normal position. This requires no attention from the driver of the truck, and he may put the truck in motion before the body has returned to normal. The new 60-degree dumping angle will greatly increase the ease with which a wet batch may be dumped.

A Builders' Steel Tower

EASE and economy of erection, and the high salvage value are features of the new steel builders' tower of the Insley Manufacturing Co., Indianapolis, Ind., designed for use in hoisting building material and concrete.

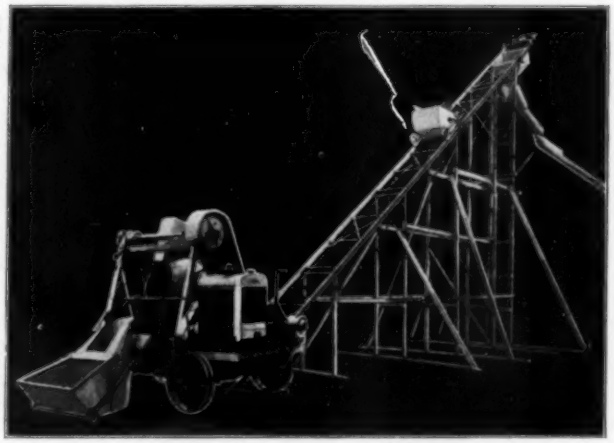
It is made entirely of structural members, the corner posts being angles 6 feet 8 inches long, which can be easily set by hand, and the diagonals and horizontals being of lighter angles, are held in place by one bolt at each end. No single piece of the tower except the top sheave beam assembly weighs more than 70 pounds.

These towers are made in two sizes for use with a 2-wheelbarrow elevator or a 3-wheelbarrow elevator. They are made as single or double compartment towers, and can be set up to any required height up to 600 feet. For hoisting concrete, a detachable bucket is mounted on the material elevator platform and is dumped by a switch located on the tower hopper. All sheaves are of the roller bearing type.

The Insley Concrete Bucket Mounted on a Material Elevator

A Plant for Placing Materials

A NEW unit, known as the Jiffy placing plant, for conveying, elevating and placing concrete and building materials, has been brought out by The Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio. The placing plant is quickly and easily erected and transported, as the sections are only 10 feet long and two men can handle any part.



The Jaeger Jiffy Placing Plant, Showing Mixer, Skip Car and Winch to Operate Car

There is no stopping of the mixer, waiting for wheelers, etc., with this plant. The batch can be dumped into the skip car as fast as it is mixed, with the result that an ordinary 7S mixer will turn out as much concrete as a 10S, or 30 to 50 more batches a day, using the same size crew, thereby cutting mixing costs to a minimum, according to the manufacturer.

Any type mixer can be used with this placing plant by using a contractor's hoist, but the Jaeger hoist mixer with oversize engine saves the wages of a hoisting engineer and requires only one power plant. Controls are so arranged that the hoist can be operated from the mixer end, and one man handles both mixer and hoist.

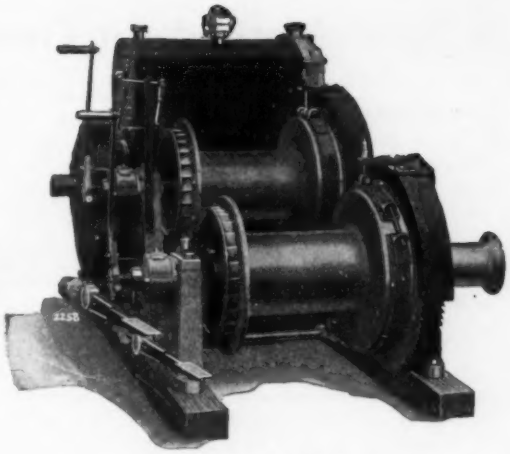
Every section of the track in this outfit is 10 feet long and has self locking joints. The supports under the track are all adjustable and fastened by clamps, so that no special tools are needed. A skeleton erecting boom is furnished with each outfit for raising each section of track.

Each outfit is furnished with spouting. While not furnished standard, either tower or floor hoppers can be supplied. After the pouring is finished the plant can be left up and a platform put on the skip car track for raising barrows, carts or mill work. The adjustments for height are in the length of supports with final adjustments at the top of each support, and there are ground adjustments on all but the two first sections.

Announcing a *New* Lidgerwood Gasoline Hoist

The Super-Utility 40

40 horsepower. 4000 pounds rope pull at 250 f.p.m.



Husky enough to put on steel work; an excellent derrick hoist; plenty of speed when you're pouring concrete; costs so little to operate you can use it on light hoisting—that's the Super-Utility 40.

Single or double drum
Drums hold 800 feet ⅝ in. rope

The Lidgerwood Utility Gasoline Hoists

Utility..... 15 hp. 2,500 lbs. 150 f.p.m.
Utility "20"..... 20 hp. 3,000 lbs. 190 f.p.m.
Super Utility..... 30 hp. 3,500 lbs. 200 f.p.m.

and now

Super Utility "40" 40 hp. 4,000 lbs. 250 f.p.m.

Lidgerwood Manufacturing Company

775 Lidgerwood Avenue — Elizabeth, New Jersey

LAUSON

½-Bag Semi-Trailer Mixers

Correct engineering and exceptionally high grade construction have given Lauson mixers their reputation for dependability and long life.

Semi-automatic discharge, convenient large hand wheel, dependable lock, blades that knead and stir, slats that give large clearance for water; drum spindle mounted on bronze bearing, Alemite lubrication throughout, engines of our own make, solid-rubber tires.

Build to Stand the Gaff

Our New ½-Bag Loader Mixer with Vertical Lift Skip Operates in ⅓ Less Space than Usual. You've Wanted It.

Write for Complete Details

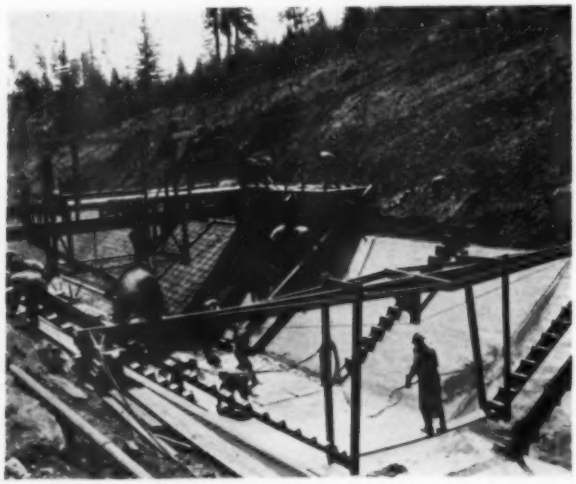
We also manufacture Diaphragm Pumpers, Contractors Saw Rigs, Plaster Mixers, complete line of Gas Engines 2-35 H. P. and 35-45 Power Units.

The John Lauson Mfg. Co., 11 Jackson St., New Holstein, Wis.

A New Method for Curing Concrete

CONTRACTORS and engineers throughout the country are now watching with extreme interest the results being obtained by a new method of curing concrete, the Hunt Process, in use in the State of Washington on a huge irrigation project of the Bureau of Reclamation of the United States Department of the Interior.

About 72,000 acres of land in the Kittitas Valley will be made suitable for cultivation through the irrigation provided by the project. Its principal features are a diversion dam on the Yakima River just above Easton; a main canal 26 miles long, a 52-mile North Branch canal, a 14-mile South Branch canal, a mile-long siphon across the Yakima River, a pumping station and several minor structures. The estimated cost of the total project will be $9,000,000. The land to be irrigated lies roughly in the form of a horse shoe around land already under cultivation.



Applying the Hunt Process for Curing the Concrete Immediately Behind the Concreting Operation on the Kittitas Valley Irrigation Project in the State of Washington

A large portion of the main canal, approximately 1,500,000 square feet, is being lined with reinforced concrete cured by the Hunt Process. This canal is 79 feet wide at the top and 12 feet at the bottom with a water depth of 9.75 feet.

The Hunt Process, developed by the Everlasting Paint & Sales Co., 1110 Board of Trade Building, Los Angeles, Calif., was first used in connection with the curing of concrete paving. The Los Angeles City Council, appreciating its advantages over the old "ponding" method, officially approved and incorporated this process in the city specifications as an alternative method. Since that time its use by contractors for all kinds of concrete work has increased rapidly.

The method entails the spraying of freshly poured concrete with a liquid, asphaltic coating. This immediately seals the pores and effects a perfect cure by utilizing the original moisture content of the concrete.

The use of old methods of curing on this particular project would, no doubt, prove difficult and awkward because of the nature of the construction. The Hunt Process allows the application of the protective coating to follow a few feet behind the pouring machine, saving time and labor. It also avoids the necessity of making temporary dams to keep the water used in curing away from new work, permits the fresh concrete to be walked on sooner, assures a uniform cure of sides and bottom, eliminates hair-checks and leaves a waterproof surface.

The Model "50" Tractor Hauling a Heavy Grader

More Power in a Tractor

IMPROVED construction, added operating convenience, and greater power are features of the Model "50" tractor of the Monarch Tractors Corp., Springfield, Ill., subsidiary of Allis-Chalmers Manufacturing Co. of Milwaukee, Wis. This is not a new model; it retains all the power and operating abilities of the 6-ton with important engineering improvements and with increased durability.

It produces 50 horsepower at the drawbar with 40 horsepower rated load. The weight is approximately 13,500 pounds, being considerably in excess of the weight of the former 6-ton.

Other new features are: tracks of pin drive type, all manganese steel, with heavy rollers engaging with the track drive sprocket; a wider seat to accommodate two; a Purolator which effectively filters the oil supply in the motor; wider radiator and hood; drop forged steel truck wheels with shafts drilled for pressure lubrication and Pomona air cleaner.

For road maintenance, contracting, snow removal, hauling and industrial work, the Monarch "50" occupies a field midway between the light and heavy-duty classes.

There are three forward speeds and one reverse. The 4-cylinder, valve-in-head, heavy-duty type of motor has been especially built for this tractor. It has a 5⅛-inch bore, 6½-inch stroke and develops 60 brake horsepower at 1,000 r.p.m.

A 6-7-Yard Athey Crawler-Type Wagon Hauled by a Caterpillar Thirty Being Loaded Back of Beverley Hills, Calif., by a Northwest Shovel

MORE SUCCESSFUL PERFORMANCE · A.G.C.-A.

Steel Sheet-Piling

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Expert engineering advice

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WHAT *MORE* COULD YOU ASK?

The McCloskey Bomb Shell Torch—

cannot be knocked over;
burns from Saturday night until Monday morning with one filling;
remains lighted during the hardest storms;
is easily carried by a special handle;
equipped with wick and ready for instant use;
used extensively for construction jobs all over the United States;
and has reduced accident claims on these jobs nearly 100 per cent!

McCLOSKEY TORCH CO.

SPITZER BLDG. TOLEDO, O.

PILE HAMMERS
CONCRETE BUCKETS

It will pay you to look up the UNION line. Write for Bulletin 63, then keep the pages handy for reference by binding them in with the *Associated Equipment Distributors Catalog.*

UNION equipment for construction work also includes Grout Mixers and Ejectors, Cableway Skips, Tunnel Shields, Air Locks, etc. (All described in Bulletin 63.)

UNION IRON WORKS

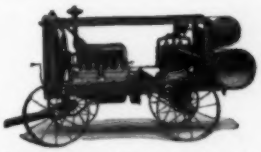
Builders of Double Acting Pile Hammers since 1906

West Shore Siding Hoboken, N. J.

Buhl

AIR COMPRESSORS

A variety of types and sizes to meet every portable compressor demand—Sold through reliable dealers and distributors.



BUHL type "Y" furnished in 115 and 160 ft. displacement

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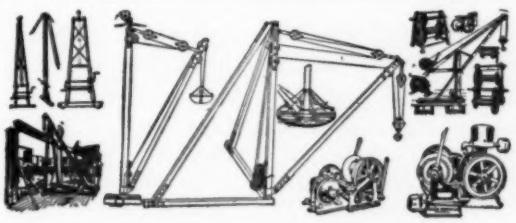

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SASGEN DERRICK CO.

3101 Grand Ave. Chicago, Ill.

HONHORST TAR HEATERS

"Built for service"

ALL STYLES
Portable and Stationary
25 to 200 gallons

See our page in Street Construction Section, Municipal Index, for the Kettle you need

Write for Pamphlet No. 15 on the New Oil Burning Heater

THE JOS. HONHORST CO.

1016 W. 6TH ST. CINCINNATI, O.

UNION WATER METER CO.

Worcester, Mass.

Union Water Meter Company is one of the few American manufacturing concerns that has progressed sixty years under the same ownership. This pioneer company began in the early sixties and incorporated in 1868 the organization which has won a place of leadership in the manufacture of water meters, valves, stops, pipe lining equipment and fire whistles. Catalog G-57 sent on request.

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[Replaces cup greases and heavy gear compounds]

Gives positive lubrication in MUD, WATER, GRIT and DUST —

The cheapest lubricant you can use regardless of the price per pound

Write

D-A LUBRICANT CO.
Incorporated
Indianapolis, Indiana

ADVANTAGEOUS READING FOR CONTRACTORS

These especially selected catalogs and pamphlets of value to contractors are for free distribution.

You will find it worth while to check these lists each month and write for the catalogs you need.

CONTRACTORS' PUMPS
Complete information and description of Humphryes contractors' pumps, that have a reputation for more gallons per day and are built to stand up under heavy loads and continuous work, is available on request to The Humphryes Manufacturing Co., Mansfield, Ohio.

ROCK AND GRAVEL CRUSHING EQUIPMENT
This is the title of an 18-page booklet of the Gruendler Patent Crusher and Pulverizer Co., St. Louis, Mo., that describes and illustrates its complete line of rock and gravel crushing equipment. The catalog is available on request.

FOLDER COVERING 4- AND 6-CYLINDER GAS ENGINE
The Wisconsin Motor Manufacturing Co., Milwaukee, Wis., has issued a series of folders describing completely each type of 4- and 6-cylinder Wisconsin gasoline engine, and including in each folder a concise statement of the field for which each particular motor is built.

A STURDY, FLEXIBLE ROAD ROLLER
The Senior road roller of The Good Roads Machinery Co., Inc., Kennett Square, Pa., that is especially suited for road work where high compression, regularity, sturdiness, and flexibility are requisites, is described in a booklet of the manufacturers, which will be sent on request.

A COMPLETE LINE OF TRACTORS
Four new pieces of Cletrac literature that cover in full specifications, descriptions and illustrations and operation views, and that describe the Model 20, 30, 40 and 100 Cletracs, have been issued by The Cleveland Tractor Co., Cleveland, Ohio.

STEEL FORMS FOR CURB, GUTTER AND SIDEWALK
Bulletin No. 1024 of the Blaw-Knox Co., 667 Farmers Bank Building, Pittsburgh, Pa., covering Blaw-Knox steel forms, includes cross sections of the complete variety of curb, curb and gutter and sidewalk which can be built with a set of these forms.

GOLD IN EVERY YARD OF EARTH
This is the title of a new folder of The Miami Trailer-Scraper Co., 610 S. Clay Street, Troy, Ohio, which describes and illustrates the money saving and profit making line of trailers and scrapers manufactured by that company.

CURING CONCRETE WITH ASPHALT
Literature describing Curcrete, an asphalt emulsion for curing concrete, and its method of application, may be secured from the Barber Asphalt Co., Philadelphia, Pa., on request.

A FULL-REVOLVING, CONVERTIBLE EXCAVATOR
A ¾-yard full-revolving, convertible shovel, crane or trencher, Type-R, that is a sturdy, compact machine, full crawler mounted with long and heavy crawlers with extra width tread shoes, and several new features of construction, is described in literature which the Bay City Dredge Works, Bay City, Mich., will be glad to send on request.

NEW MIXER CATALOG
A new 72-page catalog covering the full line of mixers and pavers of The T. L. Smith Co., 1030 32nd Street, Milwaukee, Wis., includes 11 full-page views in color showing these mixers in service on some of the outstanding construction projects such as the Cascade Tunnel, Jordan Dam, Goodrich Tire Plant, Exchequer Dam, Chicago Sewage Disposal Plant and the Memorial Bridge at Gadsden, Ala. The patented Smith End-to-Center mixing action is fully described.

NEW 32-PAGE ROAD MACHINERY CATALOG
The Galion Iron Works and Manufacturing Co., Galion, Ohio, has just issued a new 32-page illustrated general catalog covering the complete line of Galion road machinery. A copy of this catalog will be sent promptly to any municipal officials or contractors interested. This catalog covers large and small road rollers, motor graders and drawn graders of both leaning wheel and straight wheel types, as well as road drags, stone spreaders, belt conveyors and other equipment.

A MECHANICAL HORIZONTAL HOIST
A horizontal mechanical hoist, operating on the worm and spur gear principle, allowing a greater proportion of truck capacity to the chassis, saving the space occupied by a vertical hoist behind the cab, and folding compactly beneath the truck body, is described in a folder of The Van Dorn Iron Works Co., 2685 E. 79th Street, Cleveland, Ohio.

IMPORTANT ROCK DRILLING PROJECTS
This is the title of a book issued by the Ingersoll-Rand Co., 11 Broadway, New York, to fill the numerous demands of mine owners, contractors, and quarrymen for descriptive data of recent important projects. Included in the collection are articles on the Cascade Tunnel of the Great Northern Railroad, the Chicago Intake Tunnel, the Conowingo Dam, strengthening Power Dams in the Alps, extending New York City's Subways, Vermont's varied marbles, etc. Copies of this book may be had on request.

A REALLY SPEEDY POWER SAW
The Superior Speedster power saw shows records better than the saving of 100 hours per job. It is built with swinging arbor and tilting table and is the ideal machine for any contractor. The speedster is run by a gasoline engine or an electric motor and is completely described in Bulletins issued by the Jones Superior Machine Co., 1262 West North Ave., Chicago, Ill.

STEEL JOISTS AND STANCHIONS
A new handbook, Catalog S-28, on steel joists and stanchions for dwellings, apartment houses, etc., has been published by the Bethlehem Steel Co., Inc., Bethlehem, Pa., and will be sent to interested contractors and engineers on request.

A NEW LEANING WHEEL GRADER
A patrol grader with leaning wheels and telescopic rear axle, No. 22, that is suitable for light grading and ditching as well as for patrol maintenance, is described in literature which The Austin-Western Road Machinery Co., 400 No. Michigan Avenue, Chicago, Ill., will be glad to send on request.

A PLANT FOR PLACING MATERIALS
A new unit, known as the Jiffy placing plant, for conveying, elevating and placing concrete and building materials, that is quickly and easily erected and transported, and is an economical way of conveying and placing mass concrete over a large area or up to three story buildings, is described in Illustrated Specifications No. JF8 of The Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio.

WIRE BAR TIES AND TYING TOOLS
Wire bar ties and tying tools that enable contractors to speed up their reinforced concrete work, that save time and cut labor costs, and that make a tight, neat, non-slipping tie, are described in literature of the Bates Valve Bag Corp., 35 E. Wacker Drive, Chicago, Ill.

CONCRETE BLOCK MACHINERY
Concrete block machinery for hand and power operation, that is made for every size plant and affords the highest production at the lowest cost, is described in literature which the Cement Block Machinery Co., 17 Durand Street, Newark, N. J., will be glad to send on request.

A GRAVITY DUMP BODY
A cradle-like acting gravity dump body for mounting on any 1-ton or ton-and-a-half truck, that has the center of the load rising 8 inches ahead of the rear axle, and that dumps the load easily and carefully, is illustrated and described in literature of The Galion Allsteel Body Co., Galion, Ohio.

TRACK LAYING WHEELS FOR HEAVY HAULING
A new type wheel, the Creeper wheel, for hauling heavy loads over bad roads or where there are no roads, that lays its own track as it creeps along and that is made in capacities of 4, 6, 10 and 15 tons, is described in a booklet, "The Wheel Which Needs no Road," which The Creeper Wheel Co., Reading, Pa., will send on request.

1½, 2 AND 2½ H.P. ENGINES
Many new features and improvements, including the solid disc fly wheels which increase smooth running ability and, with the big key shroud, promote safety for the operator, are embodied in the Model "NC" engines of the Fuller & Johnson Manufacturing Co., Madison, Wis., which are described and illustrated in Bulletin 71 of that company.

A SELF-PROPELLING AIR COMPRESSOR
A self-propelling 4-wheel unit, combining either the Fordson or McCormick-Deering 10/20 tractors and the Quincy Model W-4 Duplex single-stage air compressor, and having a 124-cubic foot displacement, with separate radiator for the compressor, is described in an illustrated circular of the Pontiac Tractor Co., 44 West Lawrence Street, Pontiac, Mich.

SHOVEL NEWS
The Crane and Shovel Division of the Link-Belt Co., 910 South Michigan Avenue, Chicago, Ill., publishes the "Link-Belt Shovel News" telling of the services of Link-Belt crawler cranes, shovels, draglines, trench hoes and locomotive cranes. This interesting publication may be secured free by any contractor interested.

TUNNEL CONSTRUCTION VENTILATION
The adoption of du Pont Ventube and various new uses for it in underground work are interestingly described in "Tunnel Construction Ventilation," a booklet issued by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Many illustrations made from photographs of operations in connection with the building of New York's newest subways and various other projects show the methods of obtaining adequate ventilation of underground workings.

FIFTY YEARS OF ROAD BUILDING MACHINERY
The C. D. Edwards Manufacturing Co., Inc., Albert Lea, Minn., has recently published its fiftieth anniversary catalog, which carries a brief description of the machinery made in the early days of this company, beginning in 1878, and a complete description and illustrations of its complete line of machinery manufactured today.

GASOLINE-OPERATED LOCOMOTIVE CRANES
Bulletin No. 56 of the Orton Crane & Shovel Co., 608 S. Dearborn Street, Chicago, Ill., describes the savings effected in labor, time, fuel and maintenance by the use of heavy-duty gasoline-operated locomotive cranes, and is available on request.

NEW COMPRESSOR CATALOG
Bulletin No. 83-J of the Sullivan Machinery Co., 162 S. Michigan Avenue, Chicago, Ill., describes and illustrates Sullivan angle compound compressors of capacities from 300 to 5,100 cubic feet of free air per minute, as well as showing illustrations of various installations of these machines. The "Multi-step" system of load control, a distinctive feature of these machines, is described in this bulletin.

A NEW ¾-YARD SHOVEL AND CRANE
Faster swing and faster hoisting power are features of the new 72½-horsepower motor of the new gas shovel and crane, the Type "1030," that is described in literature which the Bucyrus-Erie Co., South Milwaukee, Wis., will be glad to send on request.

ROAD BUILDING WITH EUCLIDS

They move earth quickly and economically. Euclid wheelers are built to withstand the most severe strains imposed by the heaviest tractors.
Write for complete information on the Euclid line of heavy-duty wheel scrapers, rotary fresnos and all-steel tractor-drawn dump wagons.

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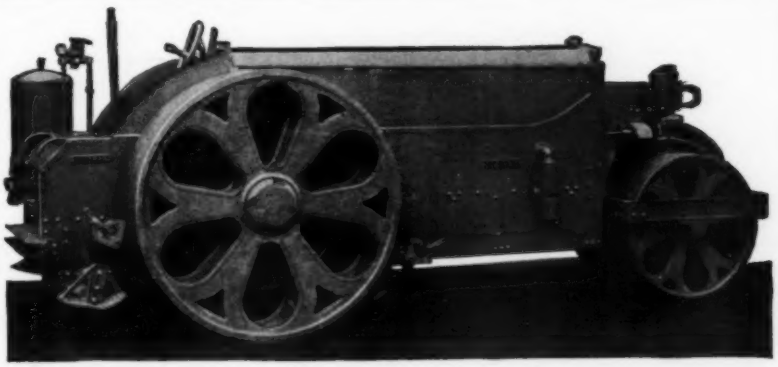

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TWO NEW CLAY DIGGERS

Two new clay diggers, No. 201 with a speed of 2,800 blows per minute suited for trimming, soft clay digging and overhead work in tunnels, and No. 202 with great power suited for hard digging in hard pan, caisson wells, tunnels and open trench, are described in literature of the Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, Ill.

NEW PAINT SPRAY EQUIPMENT

A new paint spray gun, Type EF, with a dialed head which gives numerous different spray adjustments from a circular spray to a fan, and a series of indicator numerals on the paint valve plunger providing the exact volume desired without the necessity of losing time by testing, is described in literature which The Alexander Milburn Co., 1416-1428 W. Baltimore Street, Baltimore, Md., will be glad to send on request.

MORE POWER IN A NEW TRACTOR

Improved construction, added operating convenience, and greater power are features of the Model "50" tractor of the Monarch Tractors Corp., Springfield, Ill., that retains all the power and operating abilities of the 6-ton model with important engineering improvements and with increased durability. Literature will be sent on request.

WATERPROOFING CONCRETE

Bulletins of the Adensite Co., Inc., 116 West 39th Street, New York, that describe Adensite, a liquid compound used for waterproofing portland cement concrete below grade, portland cement stucco, portland cement mortar to brick masonry, and waterproofing, hardening and dustproofing portland cement floor finish, are available on request.

A SEMI-PORTABLE AIR COMPRESSOR UNIT

Bulletin No. 140 of the Pennsylvania Pump & Compressor Co., Easton, Pa., describes and illustrates a multiple belt driven semi-portable air compressor unit, arranged for automatic start and stop control, that is self-contained, occupies limited floor space, and is easily and quickly installed.

28-DAY STRENGTH IN 24 HOURS

This is the title of an attractive booklet of the Ash Grove Lime & Portland Cement Co., Kansas City, Mo., describing and illustrating the use of Quikard cement, that is a new development in concrete construction and gives 28-day strength in 24 hours with increased strength thereafter, thus enabling you to save weeks in any type of concrete construction. The booklet will be sent to interested contractors and engineers on request.

TWO NEW SHOVEL CATALOGS

The Byers Machine Co., Ravenna, Ohio, has recently issued two new catalogs—one on the Byers Master 1¼-cubic-yard gas shovel, the other on the Byers revolving Bear Cat, a ¾-cubic-yard full revolving gas shovel. Both catalogs contain complete descriptions with mechanical working views and general specifications and are available on request.

AN AUTOMATIC TRACTOR SCRAPER

An illustrated bulletin of The Gustav Schaefer Wagon Co., 4180 Lorain Avenue, Cleveland, Ohio, describes an automatic tractor scraper, that is made in four stock sizes, is of simple design, safe to use, of strong construction and economical of operation because of its great power, speed and steady performance and the fact that only one man is needed for operation.

A PORTABLE SCREENING AND LOADING PLANT

A complete portable screening and loading plant consisting of a rigid self-supporting conveyor and a substantially built shaker screen, that can be moved from one location to another on an instant's notice, and is easily erected, is described in a catalog entitled "Northern Built Better Equipment" of the Northern Conveyor & Manufacturing Co., Janesville, Wis.

A BUILDER'S STEEL TOWER

A tower designed for use in hoisting building material and concrete, that has ease and economy of erection, and high salvage value as main features, and is made entirely of structural members, is described in literature of the Insley Manufacturing Co., Indianapolis, Ind.

LESS TIME FOR HEATING ASPHALT

The new Aeroil asphalt kettle trailer, with rubber tires, leaf springs and roller bearings, that melts and heats pitch or asphalt in one-half the time required for wood fires, and is made in 25- to 165-gallons capacity, is illustrated and described in free literature of the Aeroil Burner Co., Inc., West New York, N. J.

A NEW DUMP HOIST MECHANISM

A new rotary dump hoist mechanism which will raise the truck body to an angle of 60 degrees and that has an automatic cut-out, and requires no attention from the driver of the truck, is described in literature which the Autocar Co., Ardmore, Pa., will be glad to send on request.

AN IMPROVED DOUBLE-DRUM HOIST

An improved double-drum hoist, in two sizes, that rests on a 14-foot rigid steel frame that carries on one end the Climax gas engine and on the other the two large drums, is described and illustrated in a 32-page catalog of the Wisconsin Foundry & Machine Co., Madison, Wis.

A PORTABLE ELECTRIC SAW

A new portable electric saw known as the Crowe Safety Saw CC-16, with which one man can saw twenty-five times as much wood as two men with a cross-cut saw, is described and illustrated in circulars which The Crowe Manufacturing Corp., 317 Sycamore Street, Cincinnati, Ohio, will be glad to send to interested contractors and engineers.

A POWER SHOVEL WITH TELESCOPING HANDLE

A catalog and complete information about the Star power shovel that has the advantages of the patented telescoping handle that has full swing and the exclusive "turtle-head" beam, that handles close-quarter jobs with dexterity, has 11 feet of horizontal crowd, revolves completely in 22-foot circle, has one-man control and is convertible into a sub-digger or crane, will be sent by The Star Drilling Machine Co., Akron, Ohio.

A CENTRIFUGAL PUMP FOR DRAINAGE WORK

A rugged, light-weight centrifugal pump, that is automatically primed in a simple, practical way and stays primed as long as the engine runs, that has a capacity to 72,000 gallons per hour and a suction lift to 20 feet, is described in detail in literature which the American Steam Pump Co., Battle Creek, Mich., will send to interested parties.

A POWER DRAG SCRAPER FOR TOUGH DIGGING

A power drag scraper that is capable of hauling the toughest digging, and capable of conveying from 30 to 50 loads per hour to the hopper or pile, and that comes in sizes ranging from ¼ to 6 cubic yards, meeting the capacity requirements of every excavating problem, is illustrated and described in detail in literature of Sauerman Bros., Inc., 464 So. Clinton Street, Chicago, Ill.

A DEPENDABLE PIPE CUTTER

One cut in a ditch partly filled with water; one cut in a tight corner without disturbing other pipes or street work; one hurry-up repair job, cutting out a small section of pipe and setting in a new one—any of these operations alone saves the price of the Ellis pipe cutter that is made in two sizes, to cut all kinds of pipe 4 inches to 12 inches, and that is described in an interesting circular of the Ellis & Ford Manufacturing Co., 32 Piquette Avenue, Detroit, Mich.

A CONCRETE ROAD FINISHER

Get in touch with A. W. French & Co., 8440 Lowe Avenue, Chicago, Ill., for information of the ORD concrete road finisher, that, by using a 1-inch slump (5 gallons of water to each bag of cement) enables you to turn out a road that has a crushing strength of 4,000 pounds.

RELIABLE HOISTING BLOCKS

Let the Boston & Lockport Block Co., East Boston, Mass., help you with your hoisting block problems. Their Star brand hoisting blocks are made for every condition of service, sold by the leading supply houses, and described in literature which the company will be glad to send on request.

DEPENDABLE POWER FOR CONSTRUCTION EQUIPMENT

When a Hercules-equipped machine goes on the job old records start to crack. Dependable power, speed and efficiency as well as durability are features that make these engines popular for the hardest jobs. Literature will be sent on request by the Hercules Motors Corp., Canton, Ohio.

HOISTS FOR DEPENDABILITY AND SERVICE

A bulletin of the Dake Engine Co., Grand Haven, Mich., will be sent to contractors and engineers interested in learning more about the Dake Type "20-LG" hoists that are equipped with Timken tapered roller bearings, Alemite lubrication, model "P 20" Continental 4-cylinder engine, Cumberland ground steel shafts and many other special features.

A COMPLETE LINE OF BINS AND BATCHERS

Bins and batchers that are the last word in efficient material-handling equipment, whether you use a standard type or one built especially to your requirements, that assure ease and economy of erection, low costs and increased profits, are described in literature of the C. S. Johnson Co., Champaign, Ill.

SELF-LOADING SCRAPERS

Bulletin No. 251 of The Baker Manufacturing Co., 585 Stanford Avenue, Springfield, Ill., describes Baker Maney self-loading scrapers, that with a payroll of only two or three men, enable you to move as high as 500 to 600 yards a day with a full train of Baker Maney scrapers. These scrapers are powerful, easily operated and short turning, with successful records.

TRUCKS FOR HEAVY HAULING

Information concerning the complete line of Mack trucks, that are ruggedly built for long, hard and continuous service, will be gladly sent to interested parties by Mack Trucks, Inc., 25 Broadway, New York.

EFFICIENT TRAILER MIXERS

The new No. 3½ trailer mixer, featuring the new friction tilting device that gives more speed, greater ease and better work, is described in a complete catalog of late model, low priced mixers, which the Kwik-Mix Concrete Mixer Co., Dept. 60, Port Washington, Wis., will send on request.

PORTABLE BELT CONVEYORS

Portable belt conveyors that are manufactured in lengths of 20 to 60 feet with belts 20 inches or 24 inches in width, equipped with electric motor or gasoline engine, are described in Bulletin No. 65-C which the Fairfield Engineering Co., Marion, Ohio, will be glad to send on request, to interested contractors and engineers.

FULL-ROTATING DERRICKS

Speed up your material handling operation with the Dobbie Full-Rotating derrick of The Dobbie Foundry & Machine Co., Niagara Falls, N. Y., which is described in literature that Charles H. Foster, Secretary of The Mundy Sales Corp., 30 Church Street, New York, will send on request.

A MODERN LUBRICANT FOR MODERN EQUIPMENT

D-A lubricant, a modern lubricant for modern equipment, that replaces cup greases and heavy gear compounds, and that enables you to get better and longer service of your heavy-duty equipment, is described in literature of the D-A Lubricant Co., Inc., Indianapolis, Ind.

UNLOADERS, CONVEYORS, AND STONE SPREADERS

Write today for the new catalog of The Burch Corp., Crestline, Ohio, that describes the complete line of car unloaders, conveyors, and stone spreaders of that company, which are built for long, hard, continuous service under the most difficult conditions.

ARC WELDING BULLETIN

Two entirely different types of equipment for arc welding are compared in Engineering Bulletin No. 206 of The Lincoln Electric Co., Coit Road and Kirby Avenue, Cleveland, Ohio. These are the variable-voltage, single-operator type and the constant potential, multiple-operator type. The Bulletin is available to interested parties on request.

LUBRICATION FOR SAFETY AND ECONOMY

This is the name of a new 20-page booklet just published by E. F. Houghton & Co., Philadelphia, Pa., that relates to Houghton's absorbed oils and the Gun-Fil lubricator. It explains in detail why a proper oil feed is essential to greatest economy in lubrication, and is available to interested contractors and engineers.

A RUGGED, POWERFUL TRUCK

A rugged, powerful truck, the Road Builder, that is designed especially for road building work, has a powerful 49-H.P., 4-cylinder Ricardo head truck engine, is described and illustrated in an attractive circular of the Federal Motor Truck Co., Detroit, Mich.

A NEW CRAWLER TYPE CRANE

A new crawler crane known as the CONCO crawler, that is a modern type of gasoline or electric operated crawler crane, self contained, full circle and designed to run on the improved CONCO endless tread traction, and is built in ½-, ¾- and 1-yard capacities, is described in literature of H. D. Conkey & Co., Mendota, Ill.

A NEW 6-CYLINDER 1¾-TON TRUCK

Increased power and flexibility and greater operating ease and safety provided are but a few of the features of the new 6-cylinder, 1¾-ton truck of Graham Bros., the Truck Division of Dodge Bros., Inc., Detroit, Mich., which is described in literature of the company.